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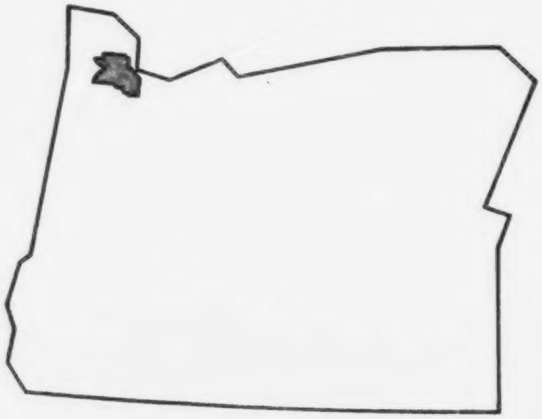
ORIGINAL

FLOOD INSURANCE STUDY

COMPLETED

236

WASHINGTON COUNTY, OREGON
UNINCORPORATED AREAS



MARCH 30, 1982

Federal Emergency Management Agency

COMMUNITY NUMBER - 410238

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FLOOD INSURANCE STUDY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the unincorporated areas of Washington County, Oregon, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert Washington County to the regular program of flood insurance by the Federal Emergency Management Agency. Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1(d). In such cases, however, it shall be understood that the State (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers, Portland District, for the Federal Emergency Management Agency, under Inter-Agency Agreement Nos. H-7-76 and H-10-77. This work, which was completed in November 1980, covered all significant flooding sources affecting Washington County.

1.3 Coordination

The initial coordination meeting was held on July 2, 1975, and attended by representatives of the Federal Emergency Management Agency, Washington County, and the study contractor. The purpose of the meeting was to identify stream sections to be studied, explain the study concepts, identify data sources, and establish communication and coordination procedures.

An intermediate coordination meeting was held on December 11, 1980, to allow local officials to review plan and profile drawings showing water-surface profiles, floodway delineations, and flooded-area outlines. Attending the meeting were representatives of the Federal Emergency Management Agency, Washington County, and the study contractor. Those in attendance recommended changes in flood boundaries, elevations, and text information.

The final coordination meeting was held on September 30, 1981, and was attended by representatives of the Federal Emergency Management Agency, the study contractor, and the Washington County Departments of Public Works and Planning. No requests for changes were made at this time.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Washington County, Oregon. The area of study is shown on the Vicinity Map (Figure 1).

The limits of detailed and approximate studies in Washington County were determined by the Federal Emergency Management Agency with community and study contractor consultation at the initial coordination meeting.

Those areas studied by detailed methods were chosen with consideration given to all proposed construction and forecasted development through 1985.

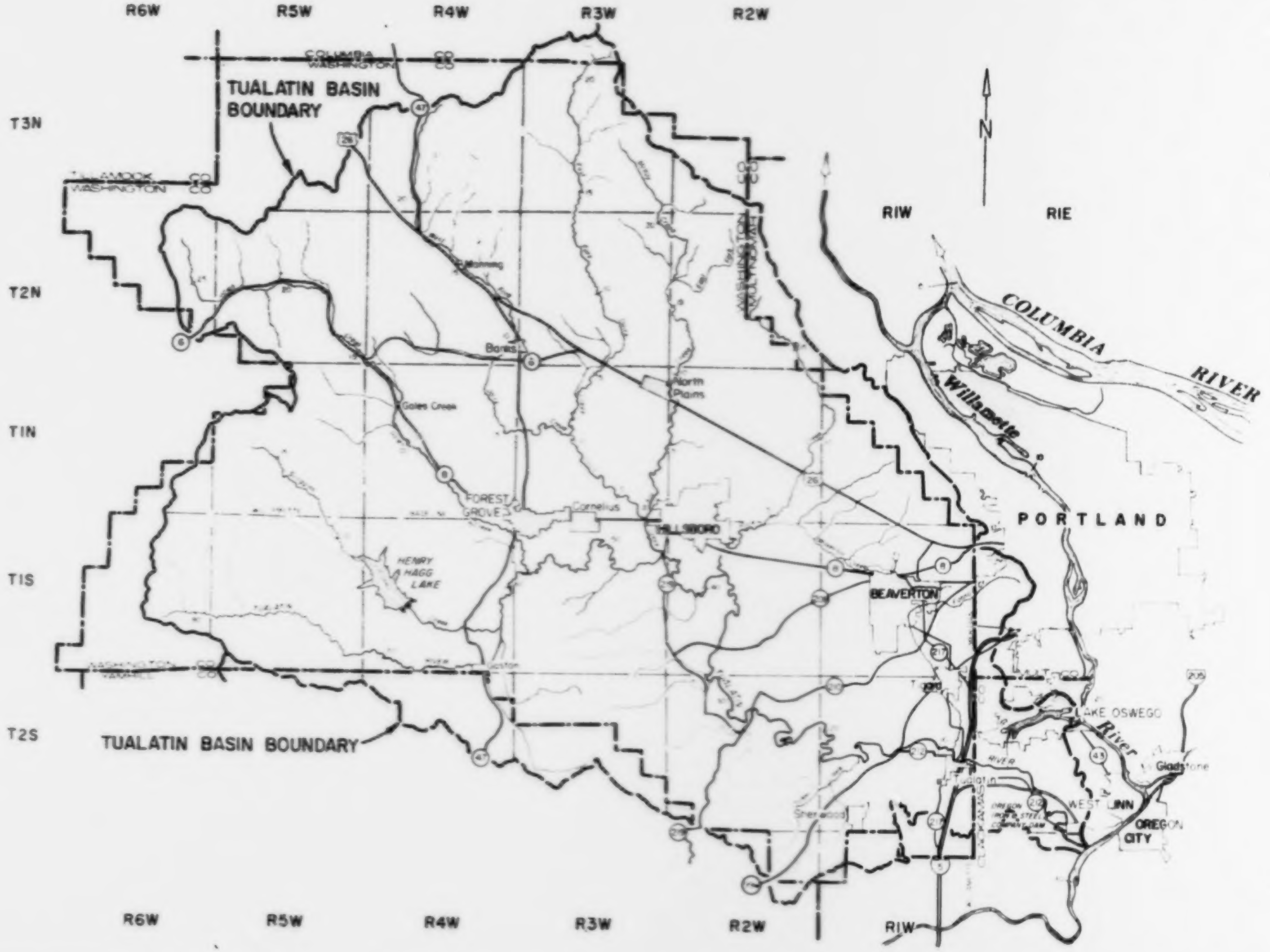
Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

Each flood source and the method of study is listed in Table 1.

Areas excluded from this study are the incorporated Cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Gaston, Hillsboro, King City, Lake Oswego, North Plains, Portland, River Grove, Sherwood, Tigard, and Tualatin.

2.2 Community Description

Washington County is located in northwestern Oregon. It is bordered on the north by Columbia County, on the south by Yamhill and Clackamas Counties, on the west by Tillamook County, and on the east by Multnomah and Clackamas Counties. Washington County experienced rapid growth during the last decade because of its location adjacent to the City of Portland. The population increased from 39,194 in 1940 to 215,000 in 1978 (Reference 1). Most of that increase occurred in the southeastern part of the county.


R6W
R5W
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RIW
RIE
N
COLUMBIA CO
WASHINGTON CO
TILLAMOOK CO
WASHINGTON CO
WASHINGTON CO
YAMHILL CO
MULT CO
TUALATIN BASIN BOUNDARY
TUALATIN BASIN BOUNDARY
COLUMBIA RIVER
Willamette
River
PORTLAND
Manning
Banks
North Plains
Gales Creek
FOREST GROVE
Cornelius
HILLSBORO
BEAVERTON
HENRY HAGG LAKE
Gaston
Tigard
Tualatin
Sherwood
LAKE OSWEGO
WEST LINN
OREGON CITY
Gladstone
OREGON IRON & STEEL COMPANY DAM
26
47
6
8
8
217
5
43
205
99W
R6W
R5W
R4W
R3W
R2W
RIW

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

5 0 5 10 15 MILES

VICINITY MAP

Table 1. Summary of Flood Sources

Flood Source	Location	Method
Tualatin River	Southeastern Washington County Limits to 1.7 Miles Upstream of Shamberg Bridge	Detailed
Tualatin River	Butternut Creek Confluence to City of Gaston Western Corporate Limits	Detailed
Fanno Creek	Mouth to Washington County Limits	Detailed
Summer Creek	Mouth to Southwest Scholls Ferry Road	Detailed
Ash Creek	Mouth to State Highway 217	Detailed
Rock Creek (Near Sherwood)	Mouth to Tualatin-Sherwood Road	Detailed
Cedar Creek	Mouth to Wilsonville Road	Detailed
Butternut Creek	Mouth to Farmington Road	Detailed
Rock Creek (Near Hillsboro)	Mouth to Northwest Union Road	Detailed
Dawson Creek	Mouth to Southern Pacific Railroad	Detailed
Beaverton Creek	Mouth to Western Avenue	Detailed
Bronson Creek	Mouth to Northwest Laidlaw Road	Detailed
Willow Creek	Mouth to N.W. 143rd Avenue	Detailed
Cedar Mill Creek	Mouth to N.W. Cornell Road	Detailed
Johnson Creek	Mouth to Southwest Hart Road	Detailed
Dairy Creek	Mouth to Susbauer Road	Detailed

Table 1. Summary of Flood Sources (Cont'd)

Flood Source	Location	Method
West Fork Dairy Creek	State Highway 6 to U.S. Highway 26	Detailed
McKay Creek	Mouth to Glencoe Road, U.S. Highway 26 to West Union Road	Detailed
Council Creek	Mouth to Purdin Road	Detailed
Gales Creek	Mouth to Gage at Kelly Creek, 17.38 Miles Above Mouth to Timber Road	Detailed
Wapato Creek	Mouth to County Limits	Detailed
Tualatin River Side Channel	Area Along Southwestern Edge of City of Cornelius	Detailed
Nyberg Slough	2.4 Miles Downstream of Interstate Highway 5 to 0.1 Mile Upstream of Interstate Highway 5	Detailed
Tualatin River	1.7 Miles Upstream of Shamberg Bridge to Butternut Creek	Approximate
Hedges Creek	Mouth to Sherwood Road	Approximate
Ash Creek	State Highway 217 to S.W. 80th Street	Approximate
Tributary to Fanno Creek	Mouth to Scholls Ferry Road	Approximate
Rock Creek (Near Sherwood)	Sherwood Road to County Limits	Approximate
Cedar Creek	Wilsonville Road to State Highway 99W	Approximate
McFee Creek	Mouth to McCormick Road	Approximate
Christensen Creek	Mouth to State Highway 219	Approximate
Butternut Creek	Baney Road to State Highway 208	Approximate

Table 1. Summary of Flood Sources (Cont'd)

Flood Source	Location	Method
Tributary to Rock Creek	Mouth to N.W. Cornell Road	Approximate
Dawson Creek	Southern Pacific Railroad to N.W. 242nd Avenue	Approximate
Rock Creek	Northwest Union Road to N.W. Germantown Road	Approximate
Unnamed Tributaries to Tualatin River	Mouth to County Limits	Approximate
Willow Creek	N.W. 143rd Avenue to N.W. Saltzman Road	Approximate
Hall Creek	Mouth to Walker Road	Approximate
Unnamed Tributary to McKay Creek	Mouth to N.E. Jackson Road	Approximate
Job Creek	Mouth to Cook Road	Approximate
Council Creek	Reaches Above Verboort Road	Approximate
Dairy Creek	Susbauer Road to Fork	Approximate
East Fork Dairy Creek	Mouth to Edge of Section 28, T. 3 N., R. 3 W.	Approximate
West Fork Dairy Creek	Mouth to State Highway 6	Approximate
McKay Creek	Glencoe Road to U.S. Highway 26	Approximate
Tributary to Tualatin River	Heather Road to Southern Pacific Railroad	Approximate
Gales Creek	Glenwood to Mouth of Kelly Creek	Approximate

All of the streams considered under this study are part of the Tualatin River drainage basin. Tualatin River originates in the Coast Range at an elevation of 3400 feet. The basin has an area of 711 square miles and is oval, approximately 40 miles long and 25 miles wide. The Tualatin River main valley floor is located in central Washington County. It occupies more than one-half of the total basin area. The major portion of the flood plain is widest in the stream length 7 miles upstream of the mouth to 70 miles upstream of the mouth.

The climate in Washington County is characterized by cool, wet winters and warm, dry summers. Maritime influences generally dominate the area throughout the year. The average temperature in January is 38°F, in July the average temperature rises to 66.5°F. The average annual precipitation for the county is 38.0 inches, which occurs primarily in the period October through March. Snowfall generally occurs on only a few days each year. Snow on the ground does not last long, and depths seldom exceed 6 inches (Reference 1).

Tualatin River valley is a broad synclinal valley, and the area of the valley floor represents a large percentage of the total watershed. The upland areas are underlain by basaltic lavas and volcanics, shale, sandstone, and conglomerates, all of which are deeply weathered and covered with loam and clayloam soils capable of supporting dense growths of vegetation. Exceptionally heavy and extended periods of rainfall cause excessive runoff and severe erosion, especially in cleared and burned areas. Two soil groups, the older valley filling and the recent alluvial, are represented on the valley floor where drainage, both surface and internal, varies from good to poor. Poor drainage at the lower end of the valley can be attributed, in part, to the existence of reefs or ledges of basaltic rock which have established a temporary base level for the valley (Reference 2).

The uplands of the basin are generally covered by heavy fir timber, with a thick undergrowth and a mat of ferns. Extensive timber cutting has taken place in this part of the basin; however, after a few years, the previous undergrowth reestablishes itself and is supplemented by ferns and wild blackberry vines. Lower down the slopes, the timber thins out until, on the valley floor, it is limited to scattered small areas. In the flood plain there are scattered scrub oak trees with bands of willow, alder, and brush as much as several hundred yards in width paralleling both banks of all major watercourses (Reference 2).

2.3 Principal Flood Problems

The past history of flooding on the streams within Washington County indicates that, for a particular storm, flooding usually occurs on many streams throughout the study area. Flooding is caused by heavy rainfall augmented by snowmelt at a time when the soil is near saturation. Damaging floods may occur any time between late October and late April. The most severe floods occur in December, January, and February.

The largest flood recorded on Tualatin River at West Linn since the U.S. Geological Survey established a stream gage there in 1928 occurred in December 1933. The peak discharge at the gage was 23,300 cubic feet per second (cfs) with an approximate return interval of 70 years. The January 1974 flood on Tualatin River caused considerable damage to the study area. That flood had an estimated discharge on Tualatin River at West Linn of 22,300 cfs with an estimated return interval of 25 years. The flood was prior to the operation of the Henry Hagg Lake Project (Reference 3). The operation of the Henry Hagg Lake Project has decreased the frequency of a flood of 21,500 cfs on Tualatin River at West Linn to a return interval of 50 years.

Other major Tualatin River floods occurred in December 1937, December 1955, December 1964, and January 1974. Prior to 1928, flooding was not well documented, but major floods occurred in February 1890, November 1896, February 1904, January 1905, and January 1914.

Records of past floods on the remaining study reaches in Washington County are not well documented. Flood damages have been small in these unincorporated areas because their flood plains are sparsely developed.

However, the flood plain of Nyberg Slough is not sparsely developed. In the 1974 flood, a business district sustained heavy damage when Tualatin River overtopped its banks and entered Nyberg Slough, an overflow channel. A Tualatin River flood with a recurrence interval greater than 15 years would be expected to flow through Nyberg Slough.

Figures 2 through 6 are photographs of past flooding in the unincorporated portion of Washington County.

2.4 Flood Protection Measures

Tualatin River basin has one multipurpose flood control storage project, Henry Hagg Lake Project, located northwest of Gaston, constructed by the U.S. Water and Power Resources Service, previously known as the Bureau of Reclamation. That project began operation in the 1974-1975 flood season. It provides 30,000 acre-feet of flood storage starting in November of each year. Flood storage capacity is reduced as the winter flood season terminates and the reservoir is filled each spring in anticipation of the summer irrigation demand. This storage would reduce the discharge of a flood such as the one of 1964 by approximately 3000 cfs.

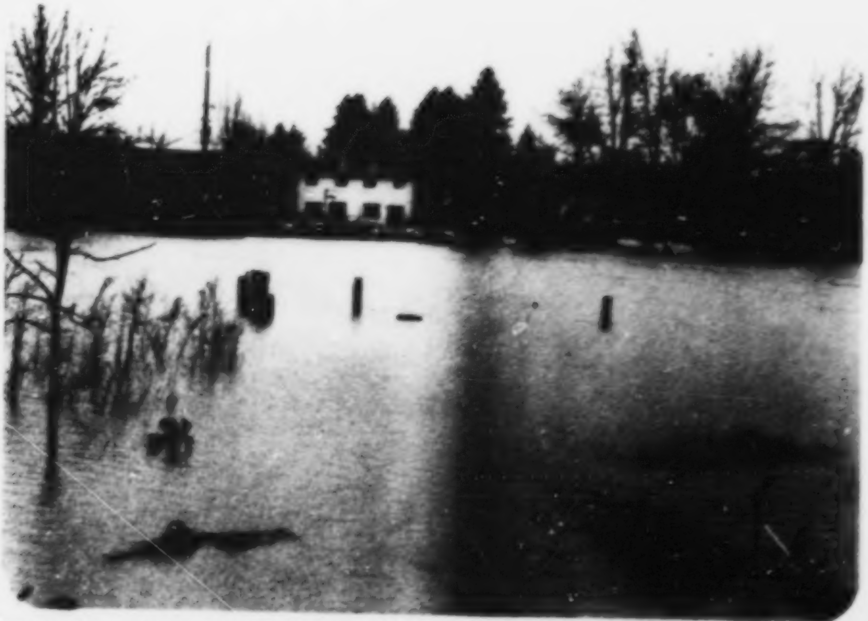


Figure 2. December 1977 Flooding on Fanno Creek Near Pacific Highway

Figure 3. December 1977 Flooding on Ash Creek Near Beaverton

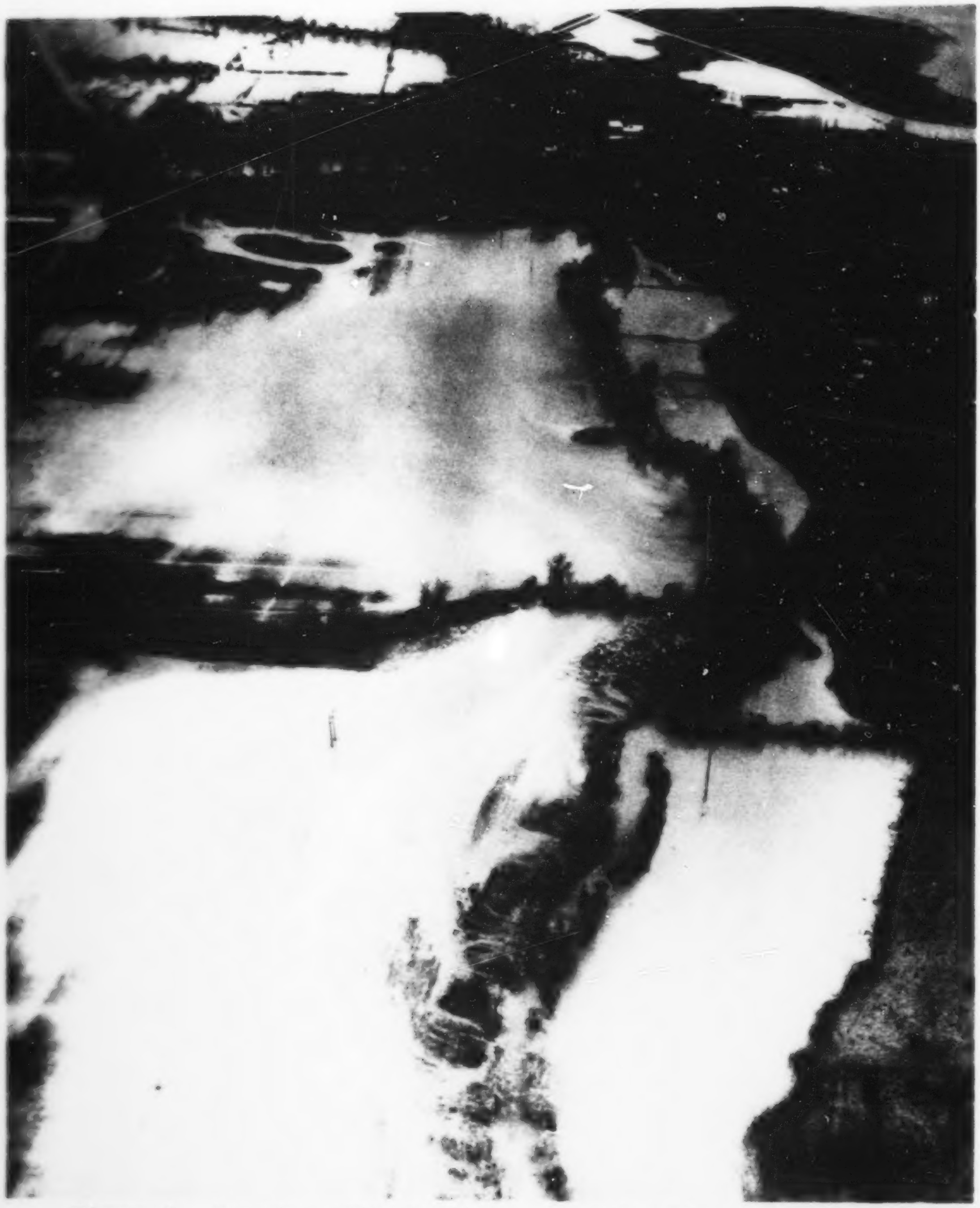


Figure 4. December 1964 Flooding on Tualatin River, View East Toward Gaston

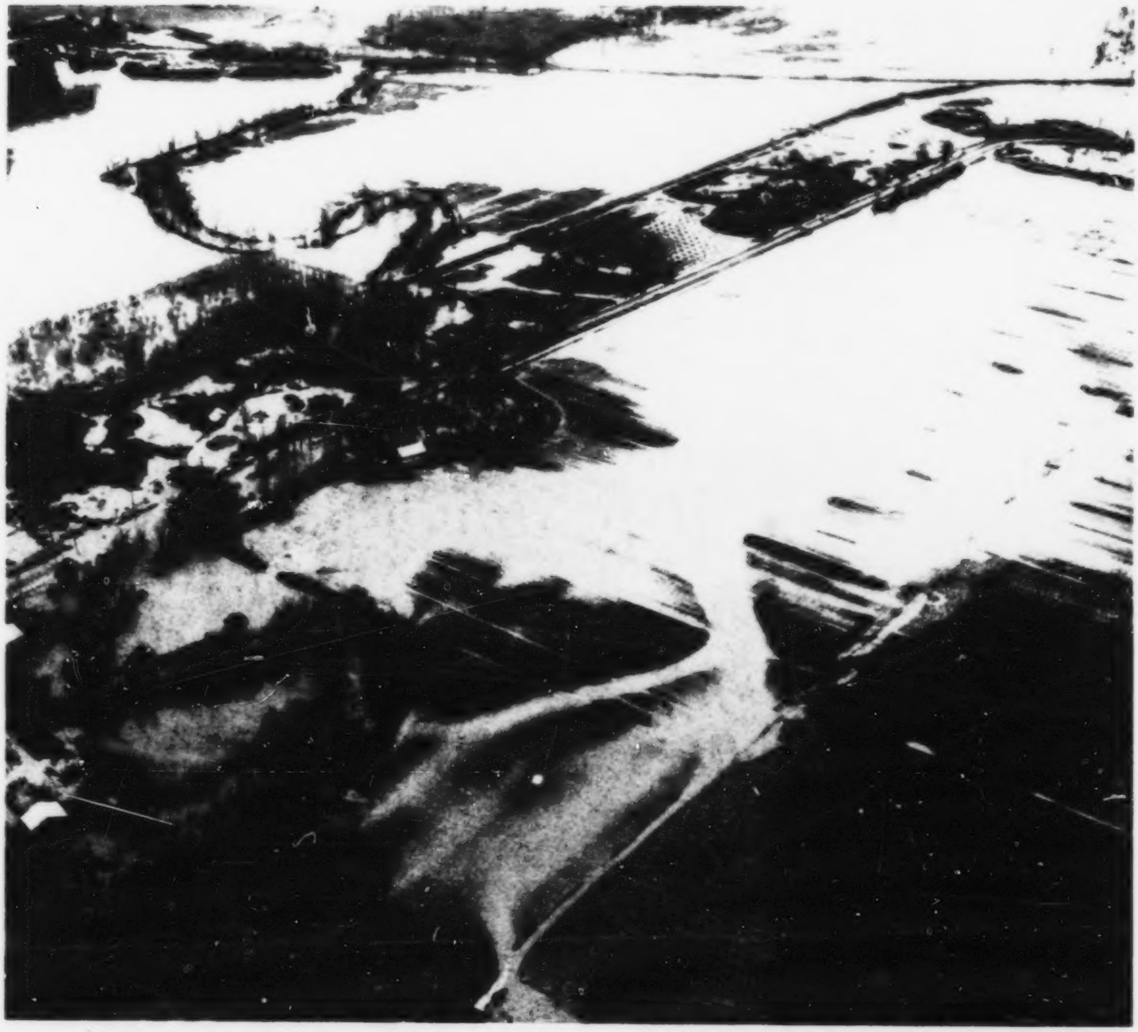


Figure 5. December 1964 Flooding on Gales Creek at Forest Grove, View Southeast

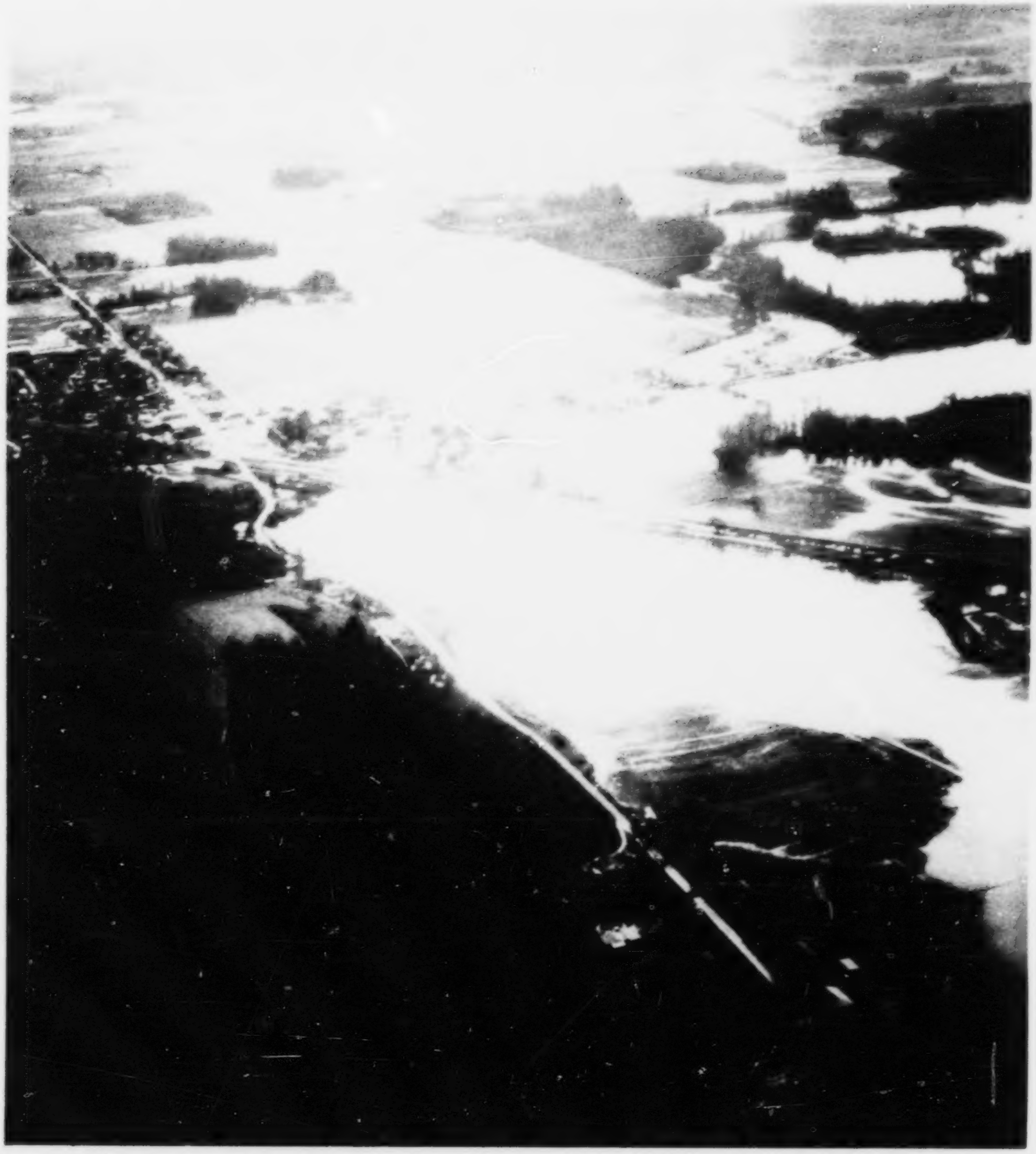


Figure 6. January 1974 Flooding on West Fork Dairy Creek at Banks

The U.S. Water and Power Resources Service has completed a draft feasibility study of two alternative storage projects on Tualatin River near Gaston which could provide additional flood storage in Tualatin River Basin. Those projects, however, are still in the planning stages and are not reflected in the data presented (Reference 3).

Nonstructural measures are also being used to aid in the prevention of future flood damage. These measures are based on a flood hazard zoning ordinance for controlling development within the 100-year flood plain. The ordinance requires the county to review all proposed development within the 100-year flood plain to ensure that it is reasonably safe from flooding.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual occurrence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the county at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the county.

Tualatin River stream-gage records were statistically analyzed, using the log-Pearson Type III distribution, as outlined by the U.S. Water Resources Council (Reference 4). Discharge-frequency curves for the U.S. Geological Survey stream gages at West Linn, Dilley, and Farmington were developed utilizing records from 1938 to 1976, 1940 to 1975, and 1939 to 1958, respectively. Due to the relatively short record, Farmington gage data were adjusted by use of the long-term station data at West Linn. All downstream discharges were adjusted for flood control furnished by the Henry Hagg Lake Project.

The U.S. Geological Survey has maintained two stream gages on Gales Creek periodically since 1935; one near the Town of Gales Creek, periods of record 1936 to 1945 and 1964 to 1970, and the other near Forest Grove, periods of record 1941 to 1956 and 1971 to the present. The U.S. Water Resources Council guidelines (Reference 4) for broken record stations were applied to these sets of data, and discharge-frequency curves were prepared for both stations.

Peak discharge-drainage area relationships for selected recurrence intervals on Dairy Creek, West Fork Dairy Creek, and McKay Creek were obtained from a Myer's rating curve developed from several nearby stream gages. These gages included three on Tualatin River, one on Gales Creek, and one on Johnson Creek in Multnomah County.

The U.S. Soil Conservation Service method for rainfall-runoff and unit hydrograph determination (Reference 5) was used in conjunction with U.S. Army Corps of Engineers computer programs (References 6, 7, and 8) for hydrograph computing, combining, and routing to generate flood hydrographs for selected recurrence intervals on the remaining detailed study streams in Washington County.

Peak discharge-drainage area relationships for each stream studied in detail are shown in Table 2.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in the county were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of these flooding sources.

Hydraulic analyses for all streams studied in detail were performed using the U.S. Army Corps of Engineers HEC-2 step-backwater computer program (Reference 9). Cross section data used in the program came from a number of sources. Cross sections are composites of data from U.S. Army Corps of Engineers field surveys, city topographic maps (References 10 through 14), and U.S. Geological Survey topographic information. All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Table 2. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Tualatin River					
At U.S. Geological Survey West Linn Gage	706	15,000	21,500	25,000	33,000
At Washington-Clackamas County Limits	686	15,100	23,000	29,500	41,000
At U.S. Geological Survey Farmington Gage	568	18,000	26,200	30,000	39,500
Fanno Creek					
At Mouth	32	2,950	3,850	4,250	5,150
Downstream of Ash Creek	24	2,750	3,500	3,850	4,700
Downstream of Summer Creek	17	1,900	2,450	2,700	3,250
At State Highway 217	10	1,400	1,800	1,970	2,400
At Washington-Clackamas County Limits	5	950	1,150	1,300	1,550
Summer Creek					
At Mouth	6	1,050	1,300	1,450	1,750
At S.W. 135th Street	4	800	1,000	1,100	1,350
Ash Creek					
At Mouth	4	750	950	1,000	1,250
At Hall Boulevard	2.5	450	600	650	800
Rock Creek (Near Sherwood)					
At Mouth	5.5	650	900	1,000	1,350
At Sherwood Road	3.5	500	700	750	1,000
Cedar Creek					
At Mouth	17	2,000	2,850	3,150	4,100
Upstream of Chicken Creek Confluence	9	1,100	1,550	1,700	2,200
At Wilsonville Road	6.5	850	1,300	1,400	1,800

Table 2. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second)			
		10-Year	50-Year	100-Year	500-Year
Butternut Creek					
At Mouth	5	620	780	870	1,050
At S.W. 198th Avenue	2.7	520	640	690	790
At S.W. 185th Avneue	1.5	300	370	400	460
Rock Creek (Near Hillsboro)					
At Mouth	74	4,100	5,850	6,550	8,750
Downstream of Dawson Creek Confluence	68	4,400	6,200	6,900	9,100
Downstream of Beaverton Creek Confluence	63	4,300	6,000	6,700	8,800
Upstream of Beaverton Creek Confluence	26	2,250	3,200	3,550	4,600
At West Union Road	19	1,800	2,500	2,800	3,600
Dawson Creek					
At Mouth	4	470	630	720	940
At S.W. Brookwood Avenue	3.5	440	600	690	900
Beaverton Creek					
Upstream of Bronson Creek Confluence	31.2	1,990	2,830	3,180	4,240
At Cedar Hills Boulevard	6.1	790	1,130	1,290	1,620
Bronson Creek					
At Mouth	3.8	510	720	800	1,030
At N.W. Kaiser Road	3.0	520	740	820	1,060
Willow Creek					
At Mouth	5.2	700	980	1,100	1,350
At N.W. 173rd Avenue	2.5	400	540	620	790

Table 2. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Cedar Mill Creek					
At Mouth	8.6	880	1,450	1,560	2,010
At N.W. Barnes	3.0	600	850	900	1,160
Johnson Creek					
At Mouth	3.7	550	770	860	1,110
Dairy Creek					
At Mouth	226	11,800	17,700	20,400	29,000
Downstream of McKay Creek Confluence	225	11,700	17,500	20,200	28,800
West Fork Dairy Creek					
At Banks Road	46	4,200	6,090	7,010	9,630
McKay Creek					
At Mouth	66	5,260	7,760	8,870	12,350
At Hornecker Road	61	5,000	7,310	8,400	11,570
Council Creek					
At Martin Road	5	700	1,000	1,100	1,450
At Beal Road	2.7	400	600	650	850
Gales Creek					
At Roderick Road Gage	66	5,800	8,150	9,150	11,600
At Stringtown Road	69	6,000	8,400	9,450	12,000
Wapato Creek					
At Mouth	22	650	1,150	1,400	2,000
At Washington County Limits	13	350	850	1,000	1,350
Nyberg Slough					
At Southwest Nyberg Street	N/A	N/A	2,970	5,770	11,460

Hydraulic roughness values (Manning's "n") for the channel and overbanks were first estimated from field observation. The "n" values were then adjusted to match high-water marks where available. Tabulated "n" values are shown in Table 3 for all streams studied in detail.

Starting water-surface elevations for Tualatin River were obtained from a hydraulic analysis performed by the U.S. Army Corps of Engineers for the West Linn Flood Insurance Study (Reference 15).

Both upstream and downstream elevations for Tualatin River Side Channel and Nyberg Slough were obtained from Tualatin River profiles located at the entrance and exit of the overbank channels. For Nyberg Slough, overflow from Tualatin River does not reach the slough for floods with less than 15-year frequency. Thus the 10-year flood is not shown on the profile for Nyberg Slough.

For all other streams studied in detail, the starting water-surface elevations were obtained using the normal-depth routine of the HEC-2 program.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

The Wapato Creek profile reflects the analysis of Tualatin River flooding controlling all elevations on Wapato Creek within this study.

Distances on the Flood Insurance Rate Map, published separately, and the Flood Boundary and Floodway Map (Exhibit 2) may not agree exactly with distances on the profiles (Exhibit 1) due to stream meanders.

The hydraulic analysis for this study is based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed and operate properly.

Approximate flood boundaries were based upon the existing Flood Plain Delineation Maps (Reference 16) and Flood Hazard Boundary Map (Reference 17).

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in the study are shown on the maps.

Table 3. Roughness Coefficient "n" Values

Stream	Overbank	Channel
Tualatin River	0.063 - 0.120	0.047 - 0.050
Fanno Creek	0.075 - 0.110	0.043 - 0.055
Summer Creek	0.075 - 0.300	0.045 - 0.080
Ash Creek	0.065 - 0.180	0.052 - 0.062
Rock Creek (Near Sherwood)	0.050 - 0.065	0.050 - 0.065
Cedar Creek	0.080 - 0.150	0.030 - 0.60
Butternut Creek	0.05 - 0.20	0.045 - 0.08
Rock Creek (Near Hillsboro)	0.08 - 0.115	0.045 - 0.055
Dawson Creek	0.08 - 0.10	0.055 - 0.080
Beaverton Creek	0.02 - 0.096	0.024 - 0.065
Bronson Creek	0.075 - 0.085	0.043 - 0.055
Willow Creek	0.09 - 0.11	0.050 - 0.055
Cedar Mill Creek	0.075 - 0.10	0.045 - 0.055
Johnson Creek	0.05 - 0.11	0.043 - 0.09
Dairy Creek	0.08 - 0.110	0.055 - 0.057
West Fork Dairy Creek	0.08 - 0.110	0.055 - 0.057
McKay Creek	0.08 - 0.110	0.056 - 0.057
Council Creek	0.080 - 0.111	0.054 - 0.055

Table 3. Roughness Coefficient "n" Values (Cont'd)

Stream	Overbank	Channel
Gales Creek	0.077 - 0.110	0.050 - 0.057
Wapato Creek	0.080 - 0.090	0.050 - 0.052
Tualatin River Side Channel	0.075	0.06
Nyberg Slough	0.050 - 0.095	0.040 - 0.050

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Emergency Management Agency as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4800, with contour intervals of 2 and 4 feet (References 11, 13, and 14).

The approximate 100-year flood boundaries were obtained from the Flood Plain Delineation Maps published by Washington County (Reference 16) and the Flood Hazard Boundary Map for Washington County (Reference 17).

Flood boundaries for the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year flood boundary has been shown. Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

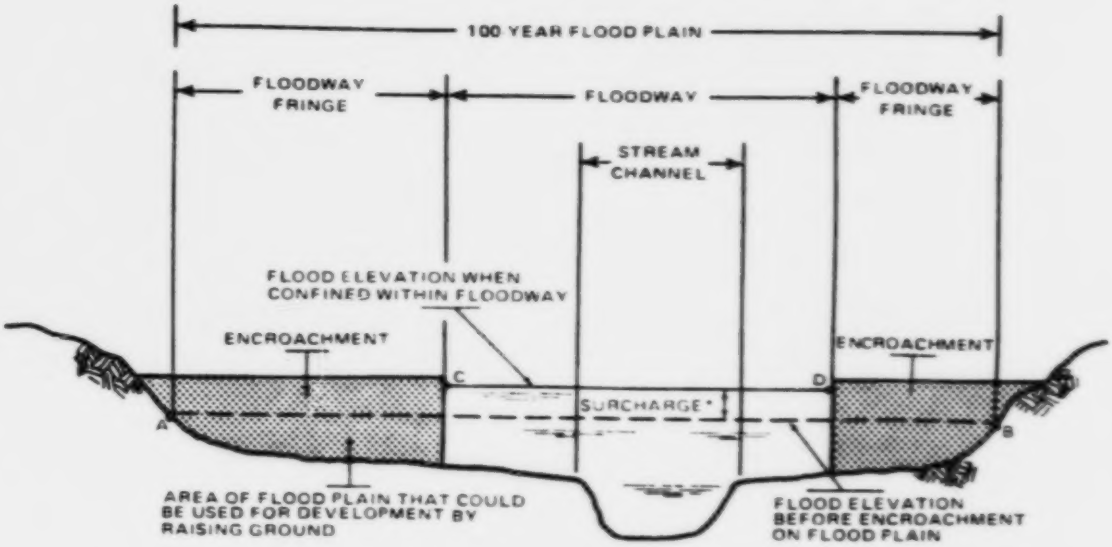
4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the Federal Emergency Management Agency limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal-conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 4).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 7.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN

LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 7. Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						(FEET NGVD)		
Tualatin River								
A	10.87	952	12,303	2.3	127.2	127.2	128.1	0.9
B	11.41	300	7,622	3.8	127.6	127.6	128.5	0.9
C	11.51	257	7,220	4.0	127.7	127.7	128.6	0.9
D	11.63	440	8,982	3.2	128.0	128.0	128.9	0.9
E	12.28	692	11,547	2.5	128.6	128.6	129.4	0.8
F	12.78	442	9,651	3.0	129.0	129.0	129.9	0.9
G	13.45	2,496	40,710	0.7	129.4	129.4	130.3	0.9
H	14.61	3,700	53,849	0.5	129.5	129.5	130.4	0.9
I	15.62	3,267	45,950	0.6	129.6	129.6	130.5	0.9
J	16.35	230	6,933	4.2	129.8	129.8	130.7	0.9
K	35.15	1,790	22,633	1.3	140.9	140.9	141.8	0.9
L	35.81	252	5,896	5.0	141.3	141.3	142.2	0.9
M	36.56	1,620	17,674	1.7	142.6	142.6	143.5	0.9
N	37.44	1,472	24,784	1.2	143.1	143.1	143.9	0.8
O	37.95	198	5,058	5.8	143.1	143.1	143.9	0.8
P	38.38	620	11,217	2.4	144.1	144.1	144.9	0.8
Q	38.48	700	11,455	2.3	144.2	144.2	145.0	0.8
R	39.22	1,280	20,710	1.3	145.0	145.0	145.8	0.8
S	40.79	1,230	20,477	1.3	145.4	145.4	146.2	0.8
T	41.56	750	13,842	1.9	145.8	145.8	146.6	0.8
U	41.69	610	12,747	2.1	146.0	146.0	146.9	0.9
V	41.74	810	15,717	1.7	146.3	146.3	147.2	0.9
W	42.27	1,540	28,124	0.9	146.5	146.5	147.4	0.9
X	42.50	1,750	33,333	0.8	146.6	146.6	147.5	0.9
Y	43.48	2,200	40,355	0.7	146.6	146.6	147.5	0.9
Z	44.36	3250/610[2]	60,668	0.4	146.7	146.7	147.6	0.9

[1] Miles Above Mouth [2] Width/Width Within County Limits

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

TUALATIN RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Tualatin River (Cont'd)								
AA	44.56	2,930	50,438	0.5	147.2	147.2	148.0	0.8
AB	44.67	3,140	52,540	0.5	147.2	147.2	148.0	0.8
AC	45.28	1,640	25,570	0.7	147.2	147.2	148.0	0.8
AD	46.04	2,165	38,508	0.4	147.3	147.3	148.1	0.8
AE	46.59	1,440	18,840	0.9	147.3	147.3	148.1	0.8
AF	47.61	1,750	20,405	0.8	147.5	147.5	148.4	0.9
AG	48.11	1,760	12,472	1.4	147.6	147.6	148.5	0.9
AH	49.28	1,550	12,243	1.4	148.5	148.5	149.4	0.9
AI	50.01	2,220	17,147	1.0	149.2	149.2	150.1	0.9
AJ	50.84	2,720	15,487	1.1	150.2	150.2	150.8	0.6
AK	52.14	2,200	10,736	1.1	151.6	151.6	152.0	0.4
AL	52.42	900	5,118	2.3	151.9	151.9	152.4	0.5
AM	52.52	850	4,223	2.8	152.4	152.4	152.9	0.5
AN	52.70	1,950	14,219	0.8	152.7	152.7	153.4	0.7
AO	53.09	1,484[2]	5,738	2.1	152.9	152.9	153.6	0.7
AP	53.48	2,230	10,198	1.2	153.4	153.4	154.2	0.8
AQ	53.78	2,610	17,560	0.7	153.7	153.7	154.5	0.8
AR	54.34	1,640	9,576	1.3	153.9	153.9	154.7	0.8
AS	54.96	1,530	10,458	1.1	154.5	154.5	155.3	0.8
AT	55.06	1,100	7,635	1.6	155.0	155.0	155.8	0.8
AU	55.14	1,360	6,675	1.8	155.0	155.0	155.9	0.9
AV	55.64	1,380	7,386	1.6	155.8	155.8	156.8	1.0
AW	56.20	1,670	8,913	1.3	156.9	156.9	157.9	1.0
AX	56.80	2,900/ 2,850[3]	12,097	1.4	158.2	158.2	158.9	0.7
AY	56.92	2,800	4,498	3.7	158.6	158.6	159.1	0.5

[1] Miles Above Mouth [2] Width Includes Islands [3] Width/Width Within County Limits

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

TUALATIN RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Tualatin River (Cont'd)								
AZ	57.06	2,660	11,982	1.4	159.9	159.9	160.7	0.8
BA	57.34	2,930	9,933	1.7	160.6	160.6	161.1	0.5
BB	58.03	2,650	9,641	1.7	162.1	162.1	162.6	0.5
BC	58.66	3,500	20,320	0.8	162.8	162.8	163.4	0.6
BD	59.55	2,900	31,040	0.4	162.9	162.9	163.5	0.6
BE	59.91	2,100	18,583	0.7	162.9	162.9	163.5	0.6
BF	60.45	2,280	14,253	0.9	163.0	163.0	163.7	0.7
BG	60.90	1,650	6,447	1.9	163.4	163.4	164.2	0.8
BH	61.66	730	4,338	2.7	166.6	166.6	167.3	0.7
BI	61.77	660	4,062	2.8	167.1	167.1	167.9	0.8
BJ	62.06	1,700	12,197	0.9	168.0	168.0	169.0	1.0
BK	62.71	2,800	16,863	0.7	168.3	168.3	169.2	0.9
BL	63.20	1,930	9,323	1.2	169.0	169.0	169.9	0.9
BM	63.26	1,910	10,738	1.1	169.2	169.2	170.0	0.8
BN	63.80	1,650	8,886	0.9	170.3	170.3	170.9	0.6
BO	64.25	1,600	7,285	1.1	171.1	171.1	171.8	0.7
BP	64.66	1,320	5,207	1.3	172.1	172.1	172.9	0.8
BQ	65.13	930/910[2]	4,020	1.7	173.5	173.5	174.5	1.0
BR	65.24	235/210[2]	2,838	2.4	178.1	178.1	178.4	0.3
BS	65.26	240/215[2]	3,976	1.7	178.6	178.6	178.9	0.3
BT	65.31	230/210[2]	1,181	5.8	178.7	178.7	179.1	0.4
BU	65.40	650	3,480	2.0	181.1	181.1	181.5	0.4
BV	66.00	600	2,961	2.3	183.9	183.9	184.6	0.7

[1] Miles Above Mouth [2] Width/Width Within County Limits

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

TUALATIN RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE
Fanno Creek								
A	2.000	390	2242	1.9	131.8	131.8	132.4	0.6
B	6.230	188	1612	2.0	159.7	159.7	160.0	0.3
C	6.270	138	1318	2.4	159.7	159.7	160.0	0.3
D	6.350	117/27[2]	744	3.6	160.1	160.1	160.5	0.4
E	6.580	300/85[2]	2298	1.2	160.5	160.5	161.2	0.7
F	10.395	57	275	7.2	193.0	193.0	193.1	0.1
G	10.632	60	349	5.6	196.5	196.5	197.3	0.8
H	10.759	100	542	3.6	198.6	198.6	199.1	0.5
I	10.884	73	457	4.3	202.4	202.4	202.6	0.2
J	10.993	55	289	6.8	204.0	204.0	204.2	0.2
K	11.085	74	348	5.4	206.9	206.9	207.3	0.4
L	11.181	115	573	3.3	208.0	208.0	208.5	0.5
M	11.500	143	476	3.9	212.3	212.3	212.6	0.3
N	11.652	156	491	3.8	214.4	214.4	215.0	0.6
O	11.723	36	292	6.4	215.3	215.3	215.9	0.6
P	11.885	270	917	1.7	217.2	217.2	218.2	1.0
Q	12.053	250	530	3.0	219.3	219.3	219.7	0.4
R	12.126	55	188	8.4	221.2	221.2	221.9	0.7
S	12.305	114	319	3.4	225.2	225.2	225.7	0.5
T	12.532	73	308	4.1	228.7	228.7	229.4	0.7
U	12.650	47	370	3.4	236.8	236.8	236.9	0.1
V	12.718	90	462	2.8	237.5	237.5	237.7	0.2
W	12.900	135	734	1.7	238.5	238.5	239.4	0.9

[1] Miles Above Confluence With Tualatin River [2] Width/Width Within County Limits

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

FANNO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Summer Creek								
A	2.01	93	169	7.0	175.0	175.0	175.2	0.2
Ash Creek								
A	0.22	46	295	3.5	160.1	158.4[2]	159.3[2]	0.9
B	0.55	26	197	4.6	160.6	160.6	161.5	0.9
C	0.71	240	965	0.9	161.8	161.8	162.8	1.0
D	0.80	225	685	1.2	162.1	162.1	163.1	1.0
E	0.94	130	162	5.3	164.8	164.8	164.8	0.0
F	1.06	19	112	6.8	166.9	166.9	167.9	1.0
G	1.09	14	78	9.8	168.6	168.6	168.9	0.3
H	1.15	70	288	2.7	171.1	171.1	172.0	0.9
I	1.23	60	117	6.1	173.4	173.4	173.6	0.2
J	1.40	50	201	3.6	177.5	177.5	178.1	0.6
K	1.50	50	133	4.9	180.6	180.6	180.6	0.0

[1] Miles Above Confluence With Fanno Creek

[2] Elevation Computed Without Consideration of Backwater From Fanno Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

SUMMER CREEK-ASH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Rock Creek (Near Sherwood)								
A	0.40	190	1,619	0.6	129.6	120.0[2]	120.9[2]	0.9
B	0.49	55	446	2.2	129.6	120.9[2]	121.0[2]	0.1
C	0.60	585	5,488	0.2	129.6	120.9[2]	121.1[2]	0.2
D	0.76	1,175	10,810	0.1	129.6	120.9[2]	121.1[2]	0.2
E	0.94	1,515	12,724	0.1	129.6	120.9[2]	121.1[2]	0.2
F	1.33	203	417	2.2	129.6	120.9[2]	121.1[2]	0.2
G	2.03	90	511	1.5	135.3	135.3	136.2	0.9
Cedar Creek								
A	1.13	2,200	4,361	0.7	129.8	121.3[2]	122.3[2]	1.0
B	1.44	1,900	3,365	0.9	129.8	122.0[2]	122.5[2]	0.5
C	1.76	1,249	677	4.5	129.8	123.4[2]	123.5[2]	0.1
D	1.81	1,020	2,015	1.5	129.8	129.5[2]	129.5[2]	0.0
E	2.14	230	824	3.7	131.1	131.1	131.2	0.1
F	2.49	210	1,225	2.5	135.5	135.5	136.0	0.5
G	2.72	155	1,418	2.2	139.0	139.0	139.2	0.2
H	2.94	160	1,238	1.4	139.6	139.6	140.5	0.9
I	3.17	210	613	2.8	140.2	140.2	141.1	0.9
J	3.21	210	1,468	1.1	140.5	140.5	141.4	0.9
K	3.48	180	720	2.3	141.3	141.3	141.9	0.6
L	3.54	70	114	14.8	145.5	145.5	145.5	0.0
M	5.24	11	288	5.2	177.1	177.1	177.6	0.5
N	5.39	90	2,011	0.7	177.7	177.7	178.2	0.5
O	5.61	90	1,065	1.3	179.4	179.4	179.8	0.4

[1] Miles Above Mouth [2] Elevation Computed Without Consideration of Backwater From Tualatin River

TABLE 4	FEDERAL EMERGENCY MANAGEMENT AGENCY WASHINGTON COUNTY, OR (UNINCORPORATED AREAS)	**FLOODWAY DATA** ROCK CREEK (NEAR SHERWOOD)-CEDAR CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Butternut Creek								
A	0.26	40	916	0.9	143.3	143.3	143.3	0.0
B	0.35	80	1,563	0.6	143.3	143.3	143.3	0.0
C	0.86	90	1,108	0.8	143.3	143.3	143.4	0.1
D	1.56	110	452	1.9	143.4	143.4	144.4	1.0
E	1.77	57	202	4.3	145.9	145.9	146.5	0.6
F	2.58	115	540	1.6	152.2	152.2	153.2	1.0
G	3.14	70	382	2.0	162.0	162.0	162.8	0.8
H	3.25	80	586	1.3	165.9	165.9	166.2	0.3
I	3.33	60	345	2.4	166.1	166.1	166.8	0.7
J	3.78	80	339	2.0	170.3	170.3	170.9	0.6
K	3.84	18	96	7.5	172.3	172.3	172.3	0.0
L	4.02	40	172	4.2	177.4	177.4	177.8	0.4
M	4.16	40	192	3.7	181.2	181.2	181.4	0.2
N	4.25	50	253	2.8	182.4	182.4	183.1	0.7
O	4.33	60	195	2.3	183.6	183.6	184.5	0.9
P	4.44	29	62	7.4	186.4	186.4	186.4	0.0
Q	4.48	35	103	4.5	187.9	187.9	187.9	0.0
R	4.59	20	106	3.7	189.3	189.3	190.2	0.9
S	4.70	30	109	3.6	190.3	190.3	190.8	0.5
T	4.82	40	212	1.9	194.7	194.7	195.0	0.3
U	4.92	40	169	2.4	194.8	194.8	195.2	0.4
V	5.05	40	165	2.5	198.5	198.5	199.2	0.7

[1] Miles Above Mouth

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

BUTTERNUT CREEK

BEST DOCUMENT AVAILABLE

BEST DOCUMENT AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Rock Creek (Near Hillsboro)								
A	0.14	607	1905	3.4	143.6	123.4[2]	124.4[2]	1.0
B	0.54	170/140[3]	1213	5.4	143.6	128.8[2]	129.6[2]	0.8
C	0.68	160/55[3]	1712	3.8	143.6	131.3[2]	131.9[2]	0.6
D	3.61	280	2275	3.0	143.6	140.5[2]	141.2[2]	0.7
E	3.80	420	3656	1.9	143.6	141.2[2]	141.9[2]	0.7
F	4.34	650	5055	1.4	143.6	142.0[2]	142.9[2]	0.9
G	5.12	510	3440	2.0	143.6	143.4[2]	144.1[2]	0.7
H	5.61	410	2814	2.4	145.1	145.1	145.6	0.5
I	5.81	120	921	3.9	146.0	146.0	146.6	0.6
J	5.87	210	1408	2.5	146.4	146.4	147.2	0.8
K	6.23	90	840	4.2	149.1	149.1	149.4	0.3
L	6.43	260	2012	1.7	149.6	149.6	150.4	0.8
M	6.85	275	1884	1.9	150.6	150.6	151.4	0.8
N	6.98	85	791	4.4	151.1	151.1	151.7	0.6
O	7.05	185	1403	2.5	151.7	151.7	152.5	0.8
P	7.24	160	1306	2.7	152.8	152.8	153.7	0.9
Q	7.46	189	1414	2.4	153.9	153.9	154.6	0.7
R	7.81	290	2324	1.5	155.1	155.1	155.9	0.8
S	8.06	300	2215	1.5	155.7	155.7	156.5	0.8
T	8.37	120	945	3.6	156.9	156.9	157.6	0.7
U	8.54	279	1940	1.8	157.8	157.8	158.6	0.8
V	9.05	241	1420	2.3	159.3	159.3	160.1	0.8
W	9.38	340	1646	2.0	161.1	161.1	161.7	0.6
X	9.61	55	460	6.8	163.8	163.8	163.9	0.1
Y	9.70	69	612	5.1	165.6	165.6	166.4	0.8
Z	9.78	320	1964	1.6	166.5	166.5	167.4	0.9

[1] Miles Above Mouth [2] Elevation Computed Without Consideration of Backwater From Tualatin River

[3] Width/Width Within County Limits

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

ROCK CREEK (NEAR HILLSBORO)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Rock Creek (Near Hillsboro) (Cont'd)								
AA	10.02	400	1953	1.6	167.2	167.2	168.0	0.8
AB	10.72	390	2472	1.2	169.4	169.4	170.3	0.9
AC	11.00	250	1368	2.0	170.2	170.2	171.1	0.9
Dawson Creek								
A	0.07	83	282	2.6	143.6	132.4[2]	133.4[2]	1.0
B	0.22	168	321	2.2	143.6	135.4[2]	136.0[2]	0.6
C	0.42	12	75	9.7	143.6	138.4[2]	139.3[2]	0.9
D	0.43	35	224	3.2	143.6	141.8[2]	141.8[2]	0.0
E	0.58	57	233	3.1	143.6	142.8[2]	143.6[2]	0.8
F	0.81	115	331	2.2	146.6	146.6	147.4	0.8
G	0.82	120	586	1.2	146.9	146.9	147.6	0.7
H	1.13	55	193	3.6	148.2	148.2	148.8	0.6

[1] Miles Above Mouth [2] Elevation Computed Without Consideration of Backwater From Tualatin River

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

ROCK CREEK(NEAR HILLSBORO)-DAWSON CREEK

TABLE 4

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Beaverton Creek								
A	0.05	400	1470	2.6	145.5	140.8[2]	141.8[2]	1.0
B	0.23	160	641	6.0	145.5	142.5[2]	143.5[2]	1.0
C	0.28	110	520	7.4	145.5	144.3[2]	145.0[2]	0.7
D	0.54	230	2119	1.8	147.6	147.6	148.5	0.9
E	0.77	180	1843	2.1	148.1	148.1	149.0	0.9
F	1.13	360	3108	1.2	148.9	148.9	149.8	0.9
G	1.23	131	1212	3.2	149.2	149.2	150.0	0.8
H	1.66	165	1577	2.4	150.9	150.9	151.7	0.8
I	2.16	425	3749	1.0	151.8	151.8	152.7	0.9
J	2.29	210	1825	2.1	151.9	151.9	152.7	0.8
K	2.38	430	3809	1.0	152.1	152.1	152.9	0.8
L	2.76	150	1215	2.6	152.3	152.3	153.1	0.8
M	3.04	200	1535	2.1	153.2	153.2	154.0	0.8
N	3.20	100	846	3.9	154.0	154.0	154.8	0.8
O	3.33	81	740	4.4	155.3	155.3	155.7	0.4
P	3.65	350	2498	1.3	156.4	156.4	157.1	0.7
Q	3.79	320	1352	2.5	156.6	156.6	157.3	0.7
R	4.13	280	2086	1.4	157.3	157.3	158.1	0.8
S	4.45	150	959	3.0	157.8	157.8	158.6	0.8
T	4.62	102	885	3.3	159.2	159.2	159.8	0.6
U	4.84	220	1668	1.7	159.7	159.7	160.5	0.8
V	5.24	198	901	3.4	160.7	160.7	161.5	0.8
W	5.53	165	1375	2.3	162.6	162.6	163.3	0.7
X	5.98	440	2732	1.1	163.5	163.5	164.2	0.7
Y	6.27	75	514	6.0	165.3	165.3	165.3	0.0
Z	6.41	250	1809	1.8	166.5	166.5	167.1	0.6

[1] Miles Above Mouth [2] Elevation Computed Without Consideration of Backwater From Rock Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

BEAVERTON CREEK

BEST DOCUMENT AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Beaverton Creek (Cont'd)								
AA	6.84	230	2196	0.9	166.8	166.8	167.5	0.7
AB	7.73	220	1883	1.1	167.0	167.0	167.8	0.8
AC	7.91	120/40[2]	1094	1.1	171.9	171.9	172.9	1.0
AD	8.06	270	2574	0.5	177.1	177.1	177.5	0.4
AE	8.43	260	2518	0.5	177.2	177.2	177.8	0.6
AF	8.70	200	2248	0.5	177.2	177.2	177.8	0.6

[1] Miles Above Mouth [2] Width/Width Within County Limits

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

BEAVERTON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Bronson Creek								
A	0.08	85	559	1.2	152.1	151.3[2]	151.8[2]	0.5
B	0.20	25	385	2.1	159.0	159.0	159.8	0.8
C	0.57	130	812	1.0	159.2	159.2	160.1	0.9
D	0.79	186	636	1.2	159.7	159.7	160.5	0.8
E	1.12	75	457	1.7	168.1	168.1	168.9	0.8
F	1.50	65	400	1.9	174.3	174.3	175.1	0.8
G	1.59	175	1365	0.6	175.6	175.6	175.7	0.1
H	1.97	70	430	1.8	178.7	178.7	178.9	0.2
I	2.15	120	390	2.0	183.6	183.6	184.3	0.7
J	2.27	30	318	2.2	191.2	191.2	191.2	0.0
K	2.29	90	620	1.1	191.3	191.3	191.5	0.2
L	2.31	110	657	1.5	191.3	191.3	191.5	0.2
M	2.71	263	481	2.1	192.4	192.4	193.4	1.0
N	3.04	150	423	2.3	198.8	198.8	199.2	0.4
O	3.09	150	351	2.8	199.6	199.6	200.5	0.9
P	3.33	175	260	3.8	207.2	207.2	207.5	0.3
Q	3.41	120	758	1.3	213.6	213.6	214.2	0.6
R	3.56	100	383	2.6	213.9	213.9	214.9	1.0
S	3.82	170	428	2.3	218.8	218.8	219.5	0.7
T	3.89	170	750	1.2	222.9	222.9	223.6	0.7
U	3.96	140	471	2.0	223.4	223.4	224.0	0.6
V	4.42	190	252	2.8	232.8	232.8	233.8	1.0
W	4.91	255	420	1.2	247.8	247.8	248.7	0.9
X	5.18	400	251	2.1	259.8	259.8	260.8	1.0
Y	5.33	130	289	1.2	268.9	268.9	269.8	0.9

[1] Miles Above Mouth [2] Elevation Computed Without Consideration of Backwater From Beaverton Creek

TABLE 4	FEDERAL EMERGENCY MANAGEMENT AGENCY WASHINGTON COUNTY, OR (UNINCORPORATED AREAS)	FLOODWAY DATA BRONSON CREEK

BEST DOCUMENT AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Willow Creek								
A	0.03	110	489	2.2	156.6	151.8[2]	152.8[2]	1.0
B	0.35	35	208	5.3	157.8	157.8	157.9	0.1
C	0.43	110	859	1.3	164.3	164.3	165.0	0.7
D	0.44	95	1029	1.1	164.3	164.3	165.0	0.7
E	0.49	140	1376	0.8	164.3	164.3	165.0	0.7
F	0.62	140	1216	0.9	164.4	164.4	165.1	0.7
G	0.94	80	500	2.1	167.8	167.8	168.4	0.6
H	1.07	85	510	2.0	168.3	168.3	169.2	0.9
I	1.21	70	492	1.3	173.1	173.1	173.5	0.4
J	1.41	55	314	2.0	173.4	173.4	174.0	0.6
K	1.58	80	681	0.9	182.5	182.5	182.7	0.2
L	1.68	60	479	1.3	182.6	182.6	182.8	0.2
M	1.97	105	474	1.2	182.8	182.8	183.5	0.7
N	2.22	170	223	2.3	189.8	189.8	189.8	0.0
O	2.42	26	236	2.2	201.4	201.4	201.4	0.0
P	2.56	25	324	1.5	207.6	207.6	207.7	0.1
Q	2.58	30	306	1.6	207.6	207.6	207.7	0.1
R	2.70	65	325	1.4	207.7	207.7	208.1	0.4
S	2.85	35	104	4.3	208.5	208.5	209.3	0.8
T	2.96	50	186	2.4	214.7	214.7	215.6	0.9
U	3.09	50	109	4.0	218.0	218.0	218.4	0.4
V	3.35	35	120	3.5	228.5	228.5	229.2	0.7
W	3.44	75	203	2.0	231.8	231.8	232.6	0.8

[1] Miles Above Mouth [2] Elevation Computed Without Consideration of Backwater From Beaverton Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

WILLOW CREEK

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BEST DOCUMENT AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Cedar Mill Creek								
A	0.05	190	718	2.2	166.6	163.6[2]	164.6[2]	1.0
B	0.30	190	711	2.2	167.4	167.4	168.0	0.6
C	0.65	41	203	7.7	173.0	173.0	173.1	0.1
D	0.74	50	376	4.3	176.9	176.9	177.0	0.1
E	0.82	130	1002	1.6	176.9	176.9	177.6	0.7
F	0.94	270	1585	1.0	177.2	177.2	178.1	0.9
G	1.06	120	799	2.0	177.3	177.3	178.2	0.9
H	1.34	160	754	2.1	180.0	180.0	180.8	0.8
I	1.57	105	712	2.3	181.5	181.5	182.2	0.7
J	1.70	120	579	1.9	186.4	186.4	186.7	0.3
K	2.09	100	397	2.7	196.7	196.7	197.3	0.6
L	2.56	1120[3]	1677	0.6	203.8	203.8	204.6	0.8
M	2.96	60	619	1.6	223.2	223.2	224.1	0.9
N	3.03	70	519	1.9	223.6	223.6	224.5	0.9
O	3.18	30	240	3.7	229.2	229.2	229.4	0.2
P	3.28	46	212	4.2	230.4	230.4	230.8	0.4
Q	3.56	40	116	7.7	241.0	241.0	241.0	0.0
R	3.67	35	157	5.6	249.3	249.3	249.8	0.5

[1] Miles Above Mouth [2] Elevation Computed Without Consideration of Backwater From Beaverton Creek

[3] Width Includes Island

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

CEDAR MILL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Johnson Creek								
A	0.236	70	615	1.4	169.8	169.8	170.5	0.7
B	0.380	80	758	1.1	169.9	169.9	170.8	0.9
C	0.550	82	671	1.3	170.0	170.0	171.0	1.0
D	0.621	83	626	1.3	175.3	175.3	175.7	0.4
E	0.676	90	1018	0.8	175.3	175.3	175.8	0.5
F	0.810	90	928	0.9	175.3	175.3	175.9	0.6
G	0.964	70	416	2.0	175.4	175.4	175.9	0.5
H	1.250	70	433	1.9	176.5	176.5	177.4	0.9
I	1.364	70	426	1.8	177.3	177.3	178.1	0.8
J	1.470	67	296	2.7	179.0	179.0	179.8	0.8
K	1.540	55	331	1.9	179.7	179.7	180.5	0.8
L	1.810	55	235	2.5	182.2	182.2	182.7	0.5
M	1.974	65	120	4.7	186.3	186.3	186.4	0.1

[1] Miles Above Confluence With Beaverton Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

JOHNSON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Dairy Creek								
A	0.62	1,449	6,360	3.2	147.2	136.9[2]	137.8[2]	0.9
B	1.04	1,242	5,939	3.4	147.2	140.8[2]	141.5[2]	0.7
C	1.62	422/402[3]	4,754	4.3	147.2	145.0[2]	146.0[2]	1.0
D	1.72	330	4,700	4.3	147.2	147.0[2]	147.9[2]	0.9
E	1.99	944/594[3]	10,997	1.8	148.4	148.4	149.4	1.0
F	2.16	300/100[3]	5,794	3.5	149.9	149.9	150.8	0.9
G	2.29	1472/ 1112[3]	20,628	1.0	150.9	150.9	151.6	0.7
H	2.77	1,666	28,974	0.6	150.9	150.9	151.6	0.7
I	3.08	1,608	19,648	0.8	151.0	151.0	151.7	0.7
J	3.64	2,261	32,084	0.5	151.1	151.1	151.8	0.7
K	4.19	2,203	20,127	0.8	151.1	151.1	151.8	0.7
L	4.69	1,848	24,913	0.6	151.2	151.2	151.9	0.7
M	5.18	770	9,691	1.6	151.3	151.3	152.0	0.7
N	5.48	1,437	14,703	1.0	151.5	151.5	152.3	0.8
O	6.12	1,017	10,678	1.4	151.8	151.8	152.6	0.8
P	6.32	1,036	10,309	1.5	153.8	153.8	154.3	0.5

[1] Miles Above Mouth [2] Elevation Computed Without Consideration of Backwater From Tualatin River
[3] Width/Width Within County Limits

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

DAIRY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
West Fork Dairy Creek								
A	15.70	1,995	10,690	0.8	186.3	186.3	187.3	1.0
B	16.02	1,941	12,626	0.7	190.4	190.4	191.3	0.9
C	16.28	2,300	21,187	0.4	191.1	191.1	192.1	1.0
D	16.84	2,700	17,943	0.4	191.3	191.3	192.3	1.0
E	17.82	2,450	16,122	0.4	196.8	196.8	197.8	1.0
F	18.68	1,200	6,645	1.1	202.8	202.8	203.7	0.9
G	18.98	1,500	10,148	0.7	203.0	203.0	203.9	0.9
H	19.41	690	1,305	5.4	203.4	203.4	204.0	0.6

[1] Miles Above Mouth of Dairy Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

WEST FORK DAIRY CREEK

BEST DOCUMENT AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
McKay Creek								
A	0.53	750/660[2]	4,342	2.0	150.9	140.8[3]	141.4[3]	0.6
B	0.91	920	4,998	1.8	150.9	142.1[3]	142.7[3]	0.6
C	1.20	324	2,536	3.5	150.9	143.4[3]	144.0[3]	0.6
D	1.27	348	2,176	4.0	150.9	144.5[3]	145.2[3]	0.7
E	1.43	356	3,240	2.7	150.9	146.0[3]	146.8[3]	0.8
F	1.69	206	2,462	3.5	150.9	147.5[3]	148.3[3]	0.8
G	2.20	269	3,387	2.5	150.9	150.5[3]	151.4[3]	0.9
H	2.26	322	3,996	2.1	151.2	151.2	152.1	0.9
I	2.34	532	6,537	1.3	151.4	151.4	152.3	0.9
J	2.51	979	10,006	0.8	151.6	151.6	152.5	0.9
K	2.70	662	7,262	1.2	151.7	151.7	152.6	0.9
L	3.21	437	4,373	1.9	152.2	152.2	153.1	0.9
M	3.74	445	4,416	1.8	155.0	155.0	156.0	1.0
N	3.98	370	4,296	1.9	155.6	155.6	156.5	0.9
O	4.36	597	6,961	1.2	156.0	156.0	156.8	0.8
P	4.58	640	6,117	1.3	156.7	156.7	157.5	0.8
Q	8.56	487	4,741	1.4	164.4	164.4	165.3	0.9
R	8.64	340	3,352	2.0	164.4	164.4	165.3	0.9
S	8.68	305	2,422	2.7	164.5	164.5	165.4	0.9
T	8.88	76	1,062	6.2	166.1	166.1	166.9	0.8
U	9.04	358	3,171	2.1	167.4	167.4	168.2	0.8
V	9.32	336	2,929	2.2	168.4	168.4	169.3	0.9
W	9.66	539	4,317	1.4	169.2	169.2	170.1	0.9
X	10.02	573[4]	4,727	1.3	169.6	169.6	170.5	0.9
Y	10.39	420/395[2]	3,603	1.7	170.2	170.2	171.1	0.9
Z	10.52	200/130[2]	1,775	3.5	170.7	170.7	171.6	0.9
AA	10.60	370	3,538	1.8	171.4	171.4	172.3	0.9

[1] Miles Above Mouth [2] Width/Width Within County Limits [3] Elevation Computed Without Consideration of Backwater From Dairy Creek [4] Floodway Lies Entirely Outside Study Area

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

McKAY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Council Creek								
A	0.55	232	1037	1.3	151.0	138.6[2]	139.4[2]	0.8
B	0.84	141	627	2.2	151.0	139.8[2]	140.4[2]	0.6
C	0.98	51	208	6.5	151.0	141.0[2]	141.6[2]	0.6
D	1.10	104	720	1.9	151.0	142.9[2]	143.5[2]	0.6
E	1.55	112	671	2.0	151.0	144.3[2]	145.3[2]	1.0
F	1.67	129[3]	904	1.5	151.0	146.0[2]	146.6[2]	0.6
G	2.06	200	1037	1.3	151.0	146.8[2]	147.3[2]	0.5
H	2.48	90	600	2.2	151.0	148.9[2]	149.5[2]	0.6
I	2.58	43	344	3.8	151.0	149.7[2]	150.0[2]	0.3
J	2.67	101	704	1.9	151.0	149.9[2]	150.5[2]	0.6
K	3.13	140	874	1.3	151.0	150.6[2]	151.4[2]	0.8
L	3.57	160	708	1.4	151.9	151.9	152.4	0.5
M	4.22	110	428	2.4	156.5	156.5	156.9	0.4
N	4.30	73	565	1.8	161.1	161.1	161.3	0.2
O	4.44	113	786	1.1	161.3	161.3	161.6	0.3
P	4.57	107	506	1.8	162.0	162.0	162.4	0.4
Q	4.64	61	342	2.6	162.3	162.3	162.8	0.5
R	5.09	82	564	1.4	163.6	163.6	164.4	0.8
S	5.51	139	634	1.2	164.5	164.5	165.4	0.9
T	5.60	100	474	1.4	165.8	165.8	166.7	0.9
U	5.77	150	735	0.9	166.3	166.3	167.0	0.7
V	6.04	22	159	2.9	168.3	168.3	168.3	0.0
W	6.16	92	455	0.6	168.3	168.3	168.5	0.2
X	6.47	79	300	0.8	168.4	168.4	168.7	0.3
Y	6.53	27	102	1.4	168.9	168.9	169.0	0.1

[1] Miles Above Mouth [2] Elevation Computed Without Consideration of Backwater From Dairy Creek

[3] Floodway Lies Entirely Outside Study Area

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

COUNCIL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Gales Creek								
A	0.80	2,000	4,233	2.4	162.8	158.8[3]	159.7[3]	0.9
B	1.49	1,500	3,744	2.7	164.2	164.2	165.0	0.8
C	1.64	900/860[2]	6,145	1.6	165.9	165.9	166.8	0.9
D	1.88	1,620	8,828	1.1	168.3	168.3	169.0	0.7
E	2.03	1,590	7,884	1.3	168.8	168.8	169.6	0.8
F	2.39	1,300	9,133	1.1	171.5	171.5	172.0	0.5
G	2.52	1,212/1,127[2]	8,651	1.2	171.9	171.9	172.5	0.6
H	2.98	1,950/1,890[2]	11,580	0.9	172.1	172.1	172.8	0.7
I	3.35	2,000	7,884	1.3	172.3	172.3	173.0	0.7
J	4.18	410	1,199	8.3	175.0	175.0	175.8	0.8
K	4.28	180	1,951	5.1	179.2	179.2	179.4	0.2
L	4.38	350	2,727	3.6	180.1	180.1	180.4	0.3
M	4.98	2,120	9,893	1.0	181.4	181.4	182.4	1.0
N	5.20	2,450	7,252	1.4	181.7	181.7	182.7	1.0
O	5.68	2,370	5,147	1.9	183.3	183.3	184.2	0.9
P	6.13	1,900	5,113	1.9	185.9	185.9	186.4	0.5
Q	6.51	1,600	3,240	3.0	187.9	187.9	188.9	1.0
R	6.93	1,260	3,861	2.5	193.3	193.3	194.3	1.0
S	7.16	660	4,170	2.3	195.3	195.3	196.0	0.7
T	7.55	570	2,044	4.8	197.7	197.7	198.5	0.8
U	7.92	190	1,826	5.2	202.0	202.0	202.9	0.9
V	7.98	225	2,229	4.2	203.5	203.5	204.1	0.6
W	8.06	470	3,750	2.5	203.8	203.8	204.8	1.0
X	3.42	350	3,469	2.7	205.4	205.4	206.3	0.9
Y	8.72	210	2,188	4.3	207.8	207.8	208.4	0.6

[1] Miles Above Mouth [2] Width/Width Within County Limits [3] Elevation Computed Without Consideration of Backwater From Tualatin River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

GALES CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Gales Creek (Cont'd)								
Z	8.98	350	2,632	3.6	210.9	210.9	211.6	0.7
AA	9.48	350	3,515	2.7	215.5	215.5	216.4	0.9
AB	9.58	90	1,215	7.5	216.3	216.3	217.0	0.7
AC	17.38	81	739	7.6	460.9	460.9	461.9	1.0
AD	17.72	75	631	8.9	473.6	473.6	474.2	0.6
AE	17.89	88	841	6.6	479.8	479.8	480.0	0.2
AF	17.97	60	383	14.5	483.1	483.1	483.1	0.0
AG	18.28	67	703	6.0	500.7	500.7	500.7	0.0
Wapato Creek								
A	0.37	778	4,817	0.3	170.4	169.8[2]	170.8[2]	1.0
B	1.34	520	3,152	0.4	171.1	169.9[2]	170.9[2]	1.0
C	1.76	312	1,962	0.6	172.0	169.9[2]	170.9[2]	1.0
D	1.90	110	1,045	1.1	172.1	170.0[2]	171.0[2]	1.0
Tualatin River Side Channel								
A	0.38	113	501	9.4	151.6	151.6	152.6	1.0
B	0.64	521	2,742	1.7	155.6	155.6	156.6	1.0
C	0.82	450	2,527	1.9	156.5	156.5	157.2	0.7
D	1.07	500	3,550	1.3	156.9	156.9	157.8	0.9
Nyberg Slough								
A	0.80	90	1,048	5.5	122.2	122.2	123.0	0.8
B	0.85	90	1,009	5.7	122.2	122.2	123.0	0.8

[1] Miles Above Mouth [2] Elevation Computed Without Consideration of Flooding From Tualatin River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOODWAY DATA

GALES CREEK-WAPATO CREEK-TUALATIN RIVER SIDE CHANNEL-NYBERG SLOUGH

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Emergency Management Agency has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each flooding source studied in detail affecting Washington County.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

Because the 100-year flooding along Wapato Creek is controlled by Tualatin River flooding, no reach was determined for Wapato Creek.

The locations of the reaches determined for the flooding sources of Washington County are shown on the Flood Profiles (Exhibit 1) and summarized in Table 5.

5.2 Flood Hazard Factors

The FHF is the Federal Emergency Management Agency device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Tualatin River							
Reach 1	0513,0514, 0518,0519	-5.5	-1.9	3.7	055	A11	Varies - See Map
Reach 2	0318,0319, 0338,0456, 0457,0476, 0479,0481	-4.9	-1.5	3.3	050	A10	Varies - See Map
Reach 3	0314,0318, 0432,0433, 0434,0441, 0442,0451, 0452,0453, 0456,0461	-1.5	-0.5	1.0	015	A3	Varies - See Map
Fanno Creek							
Reach 1	0508,0509, 0516,0517, 0519	-1.4	-0.4	0.9	015	A3	Varies - See Map
Reach 2	0507,0509	-0.9	-0.3	0.7	010	A2	Varies - See Map
Summer Creek							
Reach 1	0504,0508, 0516	-0.7	-0.2	0.5	005	A1	Varies - See Map
Ash Creek							
Reach 1	0509	-0.6	-0.2	0.5	005	A1	Varies - See Map
Rock Creek (Near Sherwood)							
Reach 1	0514,0552	-0.9	-0.2	0.7	010	A2	Varies - See Map

[1] Flood Insurance Rate Map Panel [2] Weighted Average [3] Rounded to Nearest Foot

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

TUALATIN RIVER-FANNO CREEK-SUMMER CREEK-ASH CREEK-ROCK CREEK (NEAR SHERWOOD)

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Cedar Creek							
Reach 1	0551,0513 0514,0552	-1.3	-0.4	1.0	015	A3	Varies - See Map
Reach 2	0551	-4.5	-1.1	3.2	045	A9	Varies - See Map
Reach 3	0551	-9.5	-1.5	2.5	095	A19	Varies - See Map
Butternut Creek							
Reach 1	0481	-6.0	-1.5	1.1	060	A12	143
Reach 2	0481,0482	-0.8	-0.3	0.4	010	A2	Varies - See Map
Reach 3	0482,0501	-0.6	-0.2	0.3	005	A1	Varies - See Map
Rock Creek (Near Hillsboro)							
Reach 1	0342,0343 0344	-2.2	-0.6	1.6	020	A4	Varies - See Map
Reach 2	0342,0361	-1.2	-0.3	0.9	010	A2	Varies - See Map
Dawson Creek							
Reach 1	0343	-0.8	-0.3	0.7	010	A2	Varies - See Map
Beaverton Creek							
Reach 1	0343,0344 0363,0501	-1.9	-0.5	1.4	020	A4	Varies - See Map
Reach 2	0502	-6.2	-1.5	2.4	060	A12	Varies - See Map
Reach 3	0502	-4.2	-1.5	1.8	040	A8	Varies - See Map
Bronson Creek							
Reach 1	0344	-3.6	-0.2	2.9	035	A7	Varies - See Map

[1] Flood Insurance Rate Map Panel [2] Weighted Average [3] Rounded to Nearest Foot

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

CEDAR CREEK-BUTTERNUT CREEK-ROCK CREEK (NEAR HILLSBORO)-DAWSON CREEK-BEAVERTON CREEK-BRONSON CREEK

BEST DOCUMENT AVAILABLE

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Bronson Creek (Cont'd)							
Reach 2	0344,0361 0363	-0.6	-0.1	0.9	005	A1	Varies - See Map
Reach 3	0361	-2.2	-0.1	0.6	020	A4	Varies - See Map
Reach 4	0361,0362 0366	-0.8	-0.1	0.4	010	A2	Varies - See Map
Willow Creek							
Reach 1	0363	-1.1	-0.3	0.5	010	A2	Varies - See Map
Reach 2	0363	-2.3	-0.4	0.7	025	A5	Varies - See Map
Reach 3	0362,0363 0364	-1.0	-0.7	1.4	010	A2	Varies - See Map
Cedar Mill Creek							
Reach 1	0364	-1.2	-0.2	0.7	010	A2	Varies - See Map
Reach 2	0364	-2.0	-0.4	0.5	020	A4	Varies - See Map
Reach 3	0364,0368	-0.9	-0.2	0.7	010	A2	Varies - See Map
Reach 4	0368	-0.6	-0.2	0.5	005	A1	Varies - See Map
Reach 5	0368	-2.2	-0.5	0.8	020	A4	Varies - See Map
Reach 6	0368	-0.9	-0.2	0.6	010	A2	Varies - See Map
Johnson Creek							
Reach 1	0502,0504	-0.8	-0.2	0.5	010	A2	Varies - See Map
Dairy Creek							
Reach 1	0319	-2.3	-0.6	1.6	025	A5	Varies - See Map
Reach 2	0312,0314 0316,0317 0318,0319 0336	-4.4	-1.2	3.0	045	A9	Varies - See Map

[1] Flood Insurance Rate Map Panel [2] Weighted Average [3] Rounded to Nearest Foot

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

BRONSON CREEK-WILLOW CREEK-CEDAR MILL CREEK-JOHNSON CREEK-DAIRY CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND 10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)	FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
West Fork Dairy Creek							
Reach 1	0282,0301	-2.1	-0.6	1.6	020	A4	Varies - See Map
Reach 2	0169,0188, 0282,0301	-0.8	-0.2	1.0	010	A2	Varies - See Map
Reach 3	0169,0188, 0301	-1.9	-0.3	0.5	020	A4	Varies - See Map
McKay Creek							
Reach 1	0317,0336	-3.0	-0.9	2.3	030	A6	Varies - See Map
Reach 2	0328	-2.4	-0.7	1.8	025	A5	Varies - See Map
Reach 3	0326,0328	-1.0	-0.5	1.7	010	A2	Varies - See Map
Council Creek							
Reach 1	0311,0312, 0313,0314	-1.3	-0.3	0.7	015	A3	Varies - See Map
Gales Creek							
Reach 1	0294,0313, 0451	-1.2	-0.3	0.9	010	A2	Varies - See Map
Reach 2	0294	-2.5	-0.9	0.9	025	A5	Varies - See Map
Reach 3	0291,0292, 0293,0294	-1.1	-0.3	0.6	010	A2	Varies - See Map
Reach 4	0291	-2.4	-0.6	1.3	025	A5	Varies - See Map
Reach 5	0144	-2.1	-0.6	1.3	020	A4	Varies - See Map
Tualatin River Side Channel							
Reach 1	0314,0318	-1.9	-0.6	1.2	020	A4	Varies - See Map

[1] Flood Insurance Rate Map Panel [2] Weighted Average [3] Rounded to Nearest Foot

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

WEST FORK DAIRY CREEK-McKAY CREEK-COUNCIL CREEK-
GALES CREEK-TUALATIN RIVER SIDE CHANNEL

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Nyberg Slough Reach 1	0519	-6.3[4]	-2.1	3.6	065	A13	Varies - See Map

[1] Flood Insurance Rate Map Panel [2] Weighted Average [3] Rounded to Nearest Foot

[4] Elevation Difference Between 100-Year Flood and Ground Surface

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

NYBERG SLOUGH

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire unincorporated area of Washington County was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zones A1-A13 and A19:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

The flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are summarized in Table 5.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for Washington County is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Emergency Management Agency.

6.0 OTHER STUDIES

In 1969, the U.S. Army Corps of Engineers prepared a Flood Plain Information report for Washington County (Reference 18). The 100-year flood profiles of the Tualatin River tributary streams in this report are based on available data at scattered locations along those streams. The 100-year flood profiles of this study are based on mathematical computer analyses using topographic maps and field surveys. Thus, the difference in flood heights is due to two factors: (1) improved data obtained for the Flood Insurance Studies, and (2) lower frequency-discharges, which reflect the 1974 completion of the upstream Henry Hagg Lake Project.

Flood Insurance Studies have been published for the adjacent Counties of Clackamas (Reference 19) and Tillamook (Reference 20). Flood Hazard Boundary Maps have been published for Columbia County (Reference 21) and the City of Lake Oswego (Reference 22). This Flood Insurance Study is in agreement with these studies.

The published Flood Insurance Study for the City of Portland (Reference 23) is currently in disagreement with this Flood Insurance Study along the southwestern corporate limits of Portland. Three "finger" areas of Portland extend into Washington County where flooding is shown in the Washington County study but not studied for the Portland study. The Portland study will be revised to match the adjacent flooded areas in Washington County.

A Flood Hazard Boundary Map for Washington County has been previously published (Reference 17). This Flood Insurance Study is more detailed and thus supersedes that map.

The Federal Emergency Management Agency is preparing Flood Insurance Studies for the adjacent Counties of Multnomah (Reference 24) and Yamhill (Reference 25), and the following incorporated communities within Washington County: Beaverton (Reference 26), Cornelius (Reference 27), Durham (Reference 28), Forest Grove (Reference 29), Gaston (Reference 30), Hillsboro (Reference 31), North Plains (Reference 32), Sherwood (Reference 33), Tigard (Reference 34), and Tualatin (Reference 3). This Flood Insurance Study will be in agreement with those studies.

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supersede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Federal Regional Center, 130 228th Street, SW., Bothell, Washington 98011.

8.0 BIBLIOGRAPHY AND REFERENCES

1. State of Oregon, Secretary of State, Oregon Blue Book, 1979-1980

2. U.S. Department of the Army, Corps of Engineers, Portland District, Review of Survey Report on Tualatin River, Oregon, Appendix A, December 1953

3. Federal Emergency Management Agency, Flood Insurance Study, City of Tualatin, Washington County, Oregon, unpublished

4. U.S. Water Resources Council, Hydrology Committee, "Guidelines for Determining Flood Flow Frequency," Bulletin 17A, June 1977

5. U.S. Department of Agriculture, Soil Conservation Service, SCS National Engineering Handbook, August 1972

6. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, Unit Graph and Hydrograph Computation, Computer Program 23-J2-L228, Davis, California, July 1966

7. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, Hydrographic Combining and Routings, Computer Program 23-J2-L232, Davis, California, August 1966

8. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, Flood Hydrograph Package (HEC-1), Davis, California, January 1973

9. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, November 1976, updated October 1977

10. Unified Sewerage Agency of Washington County, Orthophoto Topographic Maps, Scale 1:4800, Contour Interval 2 feet, 1975

11. City of Beaverton, Oregon, Topographic Maps, Scale 1:4800, Contour Interval 4 feet, Spencer B. Gross, May 1971

12. City of Tigard, Oregon, Topographic Maps, Scale 1:4800, Contour Interval 4 feet, Aerial Mapping Company of Oregon, 1974

13. City of Tualatin, Oregon, Topographic Maps, Scale 1:2400, Contour Interval 2 feet, Aerial Mapping Company of Oregon, 1972

14. U.S. Department of the Army, Corps of Engineers, Topographic Maps, Scale 1:4800, Contour Interval 4 feet, Spencer B. Gross, May 1977

15. Federal Emergency Management Agency, Federal Emergency Management Agency, Flood Insurance Study, City of West Linn, Washington County, Oregon, unpublished

16. Washington County, Oregon, Department of Public Works, Flood Plain Delineation Maps, Washington County, Oregon, Scale 1:12,000, Contour Interval variable, 1974

17. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Washington County, Oregon (Unincorporated Areas), Scale 1:24,000, Revised 1977

18. U.S. Department of the Army, Corps of Engineers, Portland District, Flood Plain Information, Washington County, Oregon, June 1969

19. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Clackamas County, Oregon (Unincorporated Areas), March 1978

20. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Tillamook County, Oregon (Unincorporated Areas), May 1978

21. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Columbia County, Oregon (Unincorporated Areas), Scale 1:24,000, Revised 1977

22. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Lake Oswego, Clackamas County, Oregon, November 22, 1977

23. Federal Emergency Management Agency, Flood Insurance Study, City of Portland, Multnomah, Clackamas, and Washington Counties, Oregon, July 16, 1980

24. Federal Emergency Management Agency, Flood Insurance Study, Multnomah County, Oregon (Unincorporated Areas), unpublished

25. Federal Emergency Management Agency, Flood Insurance Study, Yamhill County, Oregon (Unincorporated Areas), unpublished

26. Federal Emergency Management Agency, Flood Insurance Study, City of Beaverton, Washington County, Oregon, unpublished

27. Federal Emergency Management Agency, Flood Insurance Study, City of Cornelius, Washington County, Oregon, unpublished

28. Federal Emergency Management Agency, Flood Insurance Study, City of Durham, Washington County, Oregon, unpublished

29. Federal Emergency Management Agency, Flood Insurance Study, City of Forest Grove, Washington County, Oregon, unpublished

30. Federal Emergency Management Agency, Flood Insurance Study, City of Gaston, Washington County, Oregon, unpublished

31. Federal Emergency Management Agency, *Flood Insurance Study, City of Hillsboro, Washington County, Oregon*, unpublished

32. Federal Emergency Management Agency, *Flood Insurance Study, City of North Plains, Washington County, Oregon*, unpublished

33. Federal Emergency Management Agency, *Flood Insurance Study, Town of Sherwood, Washington County, Oregon*, unpublished

34. Federal Emergency Management Agency, *Flood Insurance Study, City of Tigard, Washington County, Oregon*, unpublished

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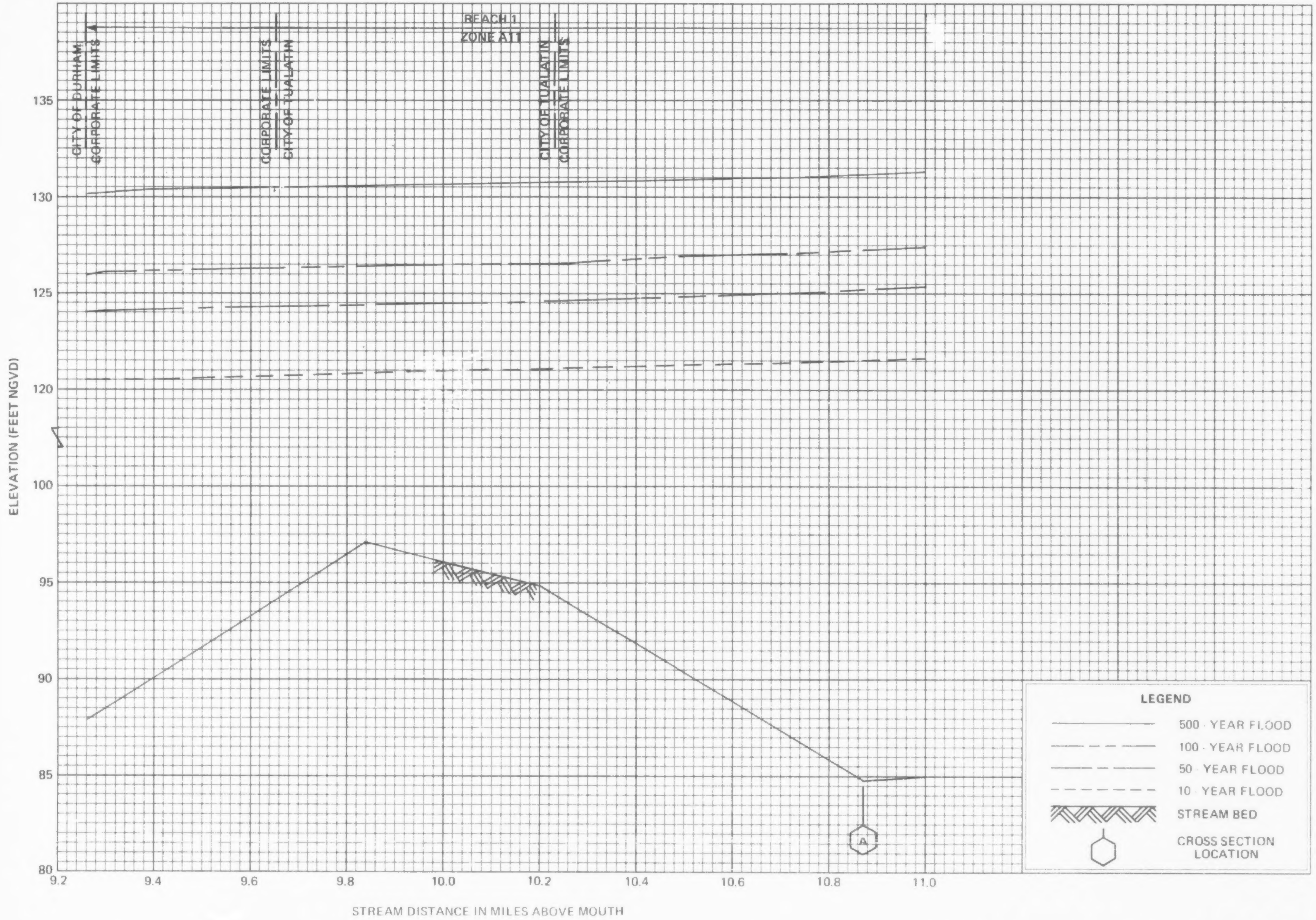


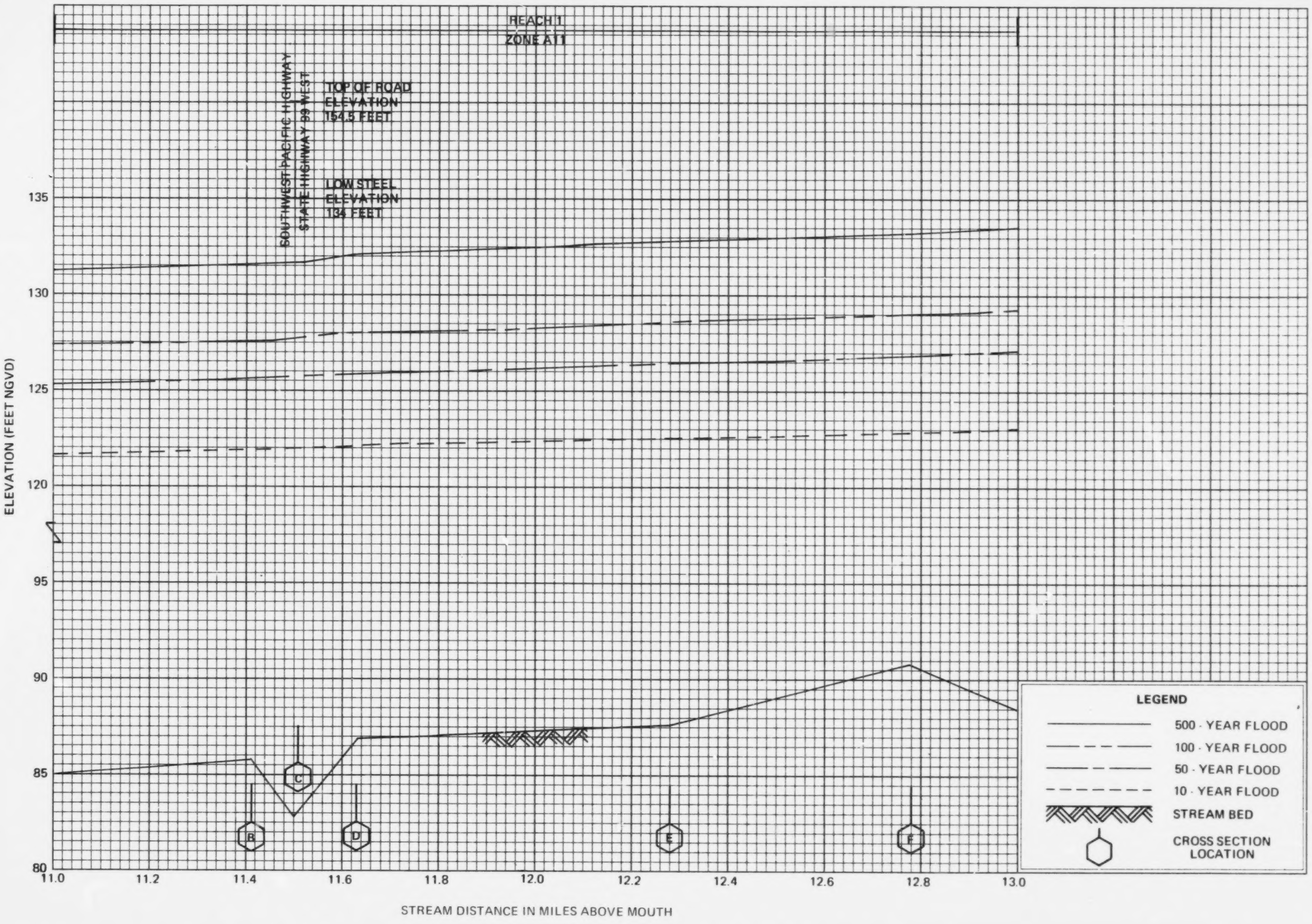
FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

01P



FLOOD PROFILES

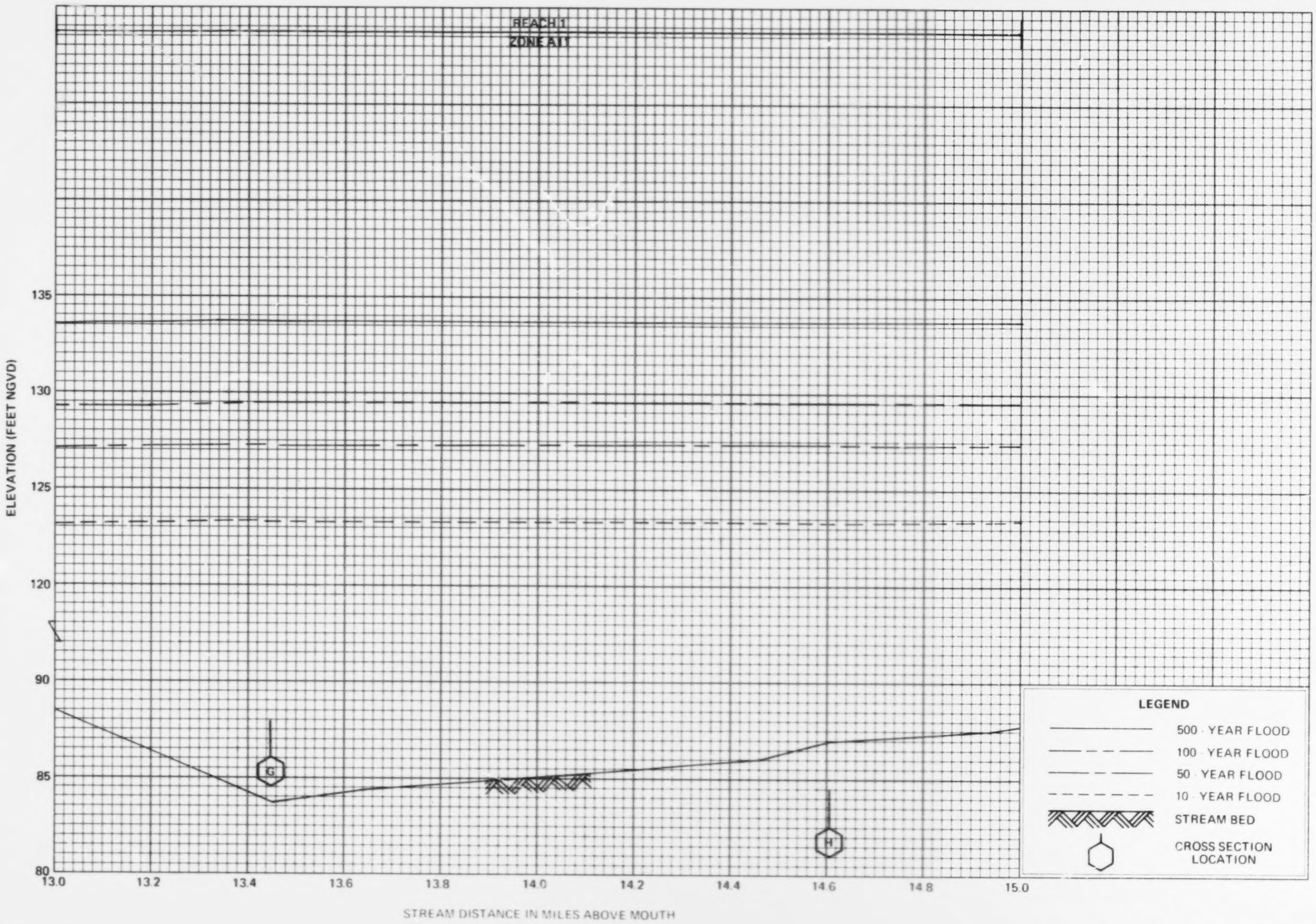
TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

02P

56



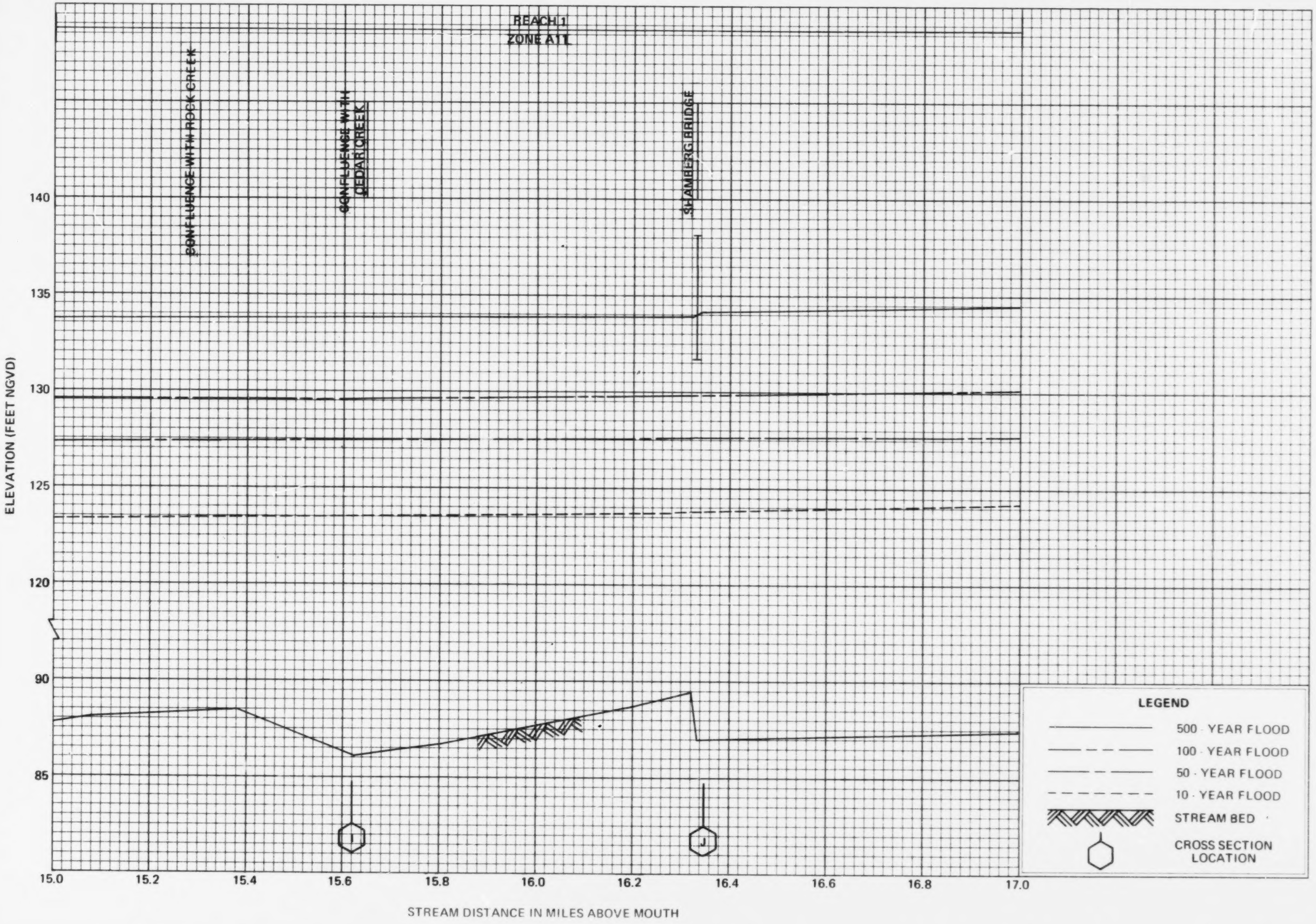
FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

03P



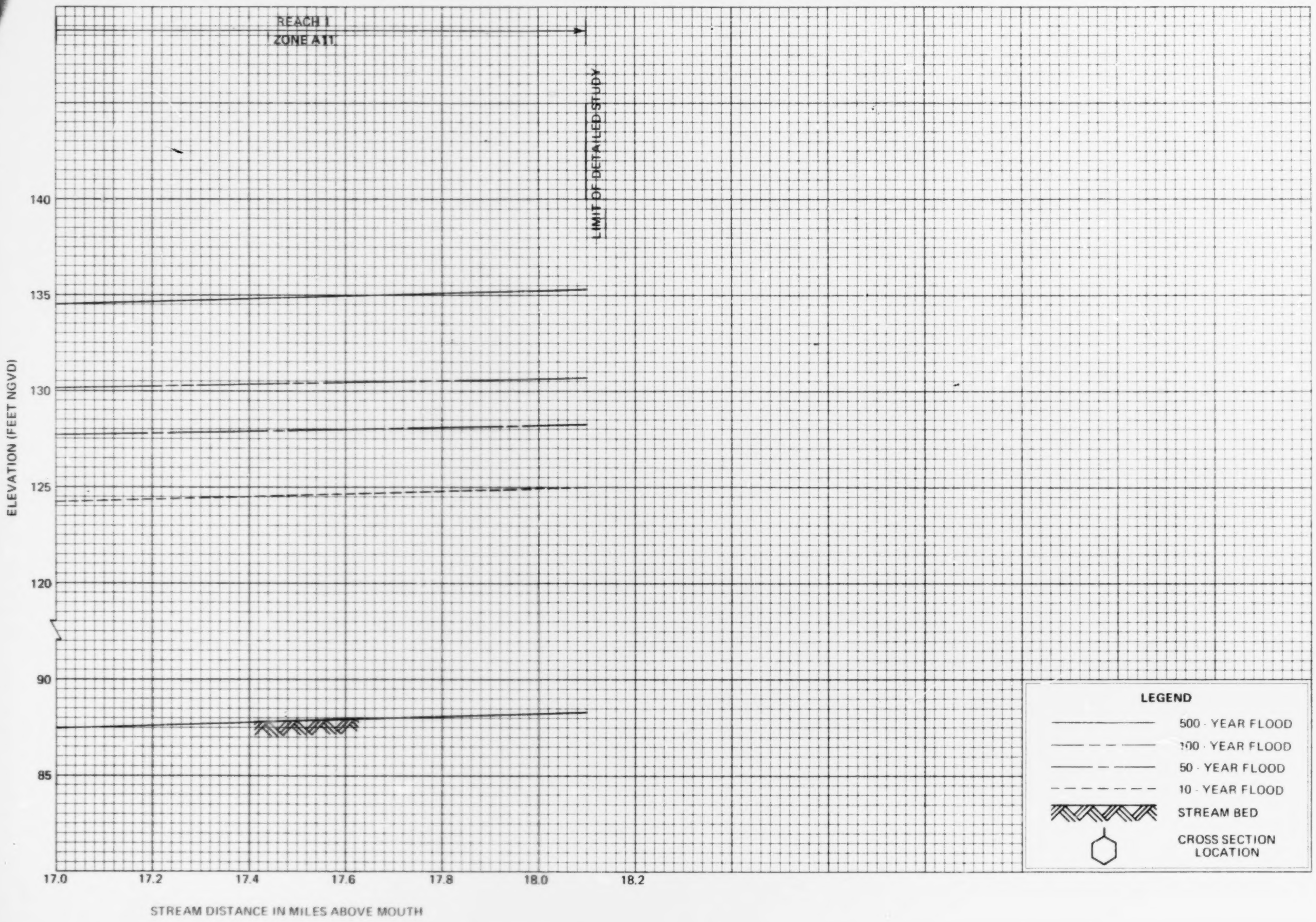
FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

04P



FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

05P

59

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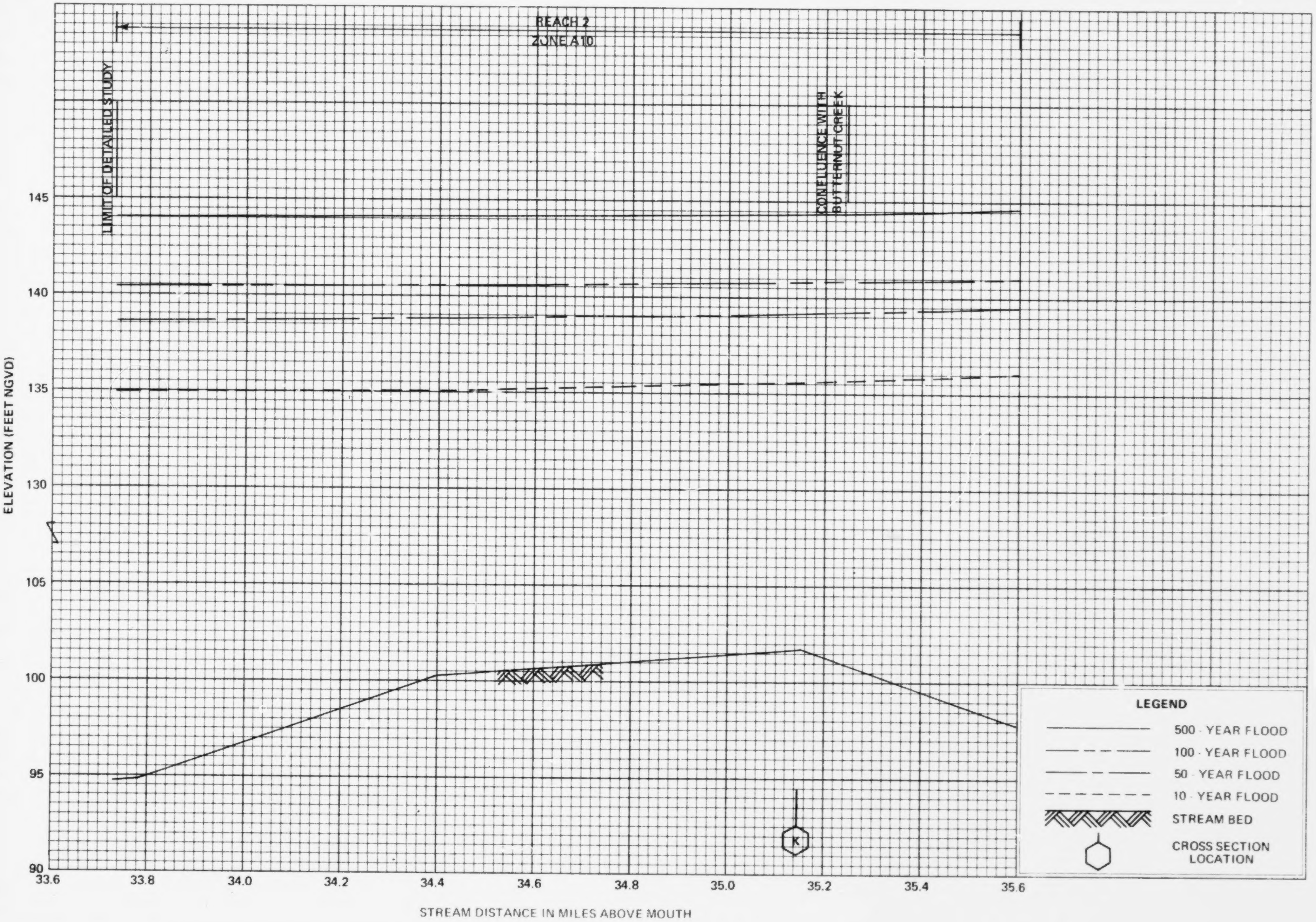


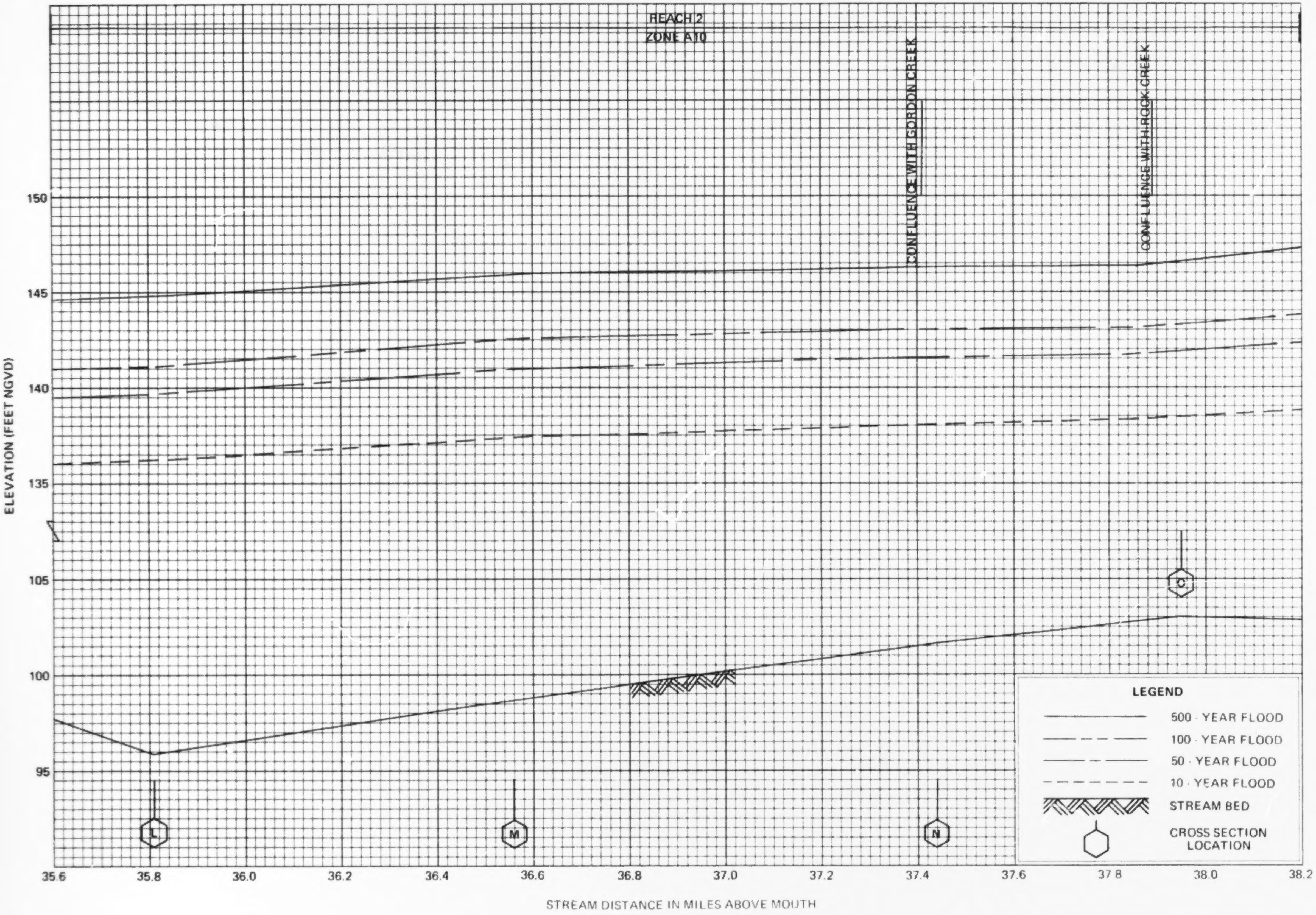
FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

06P



FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

07P

61

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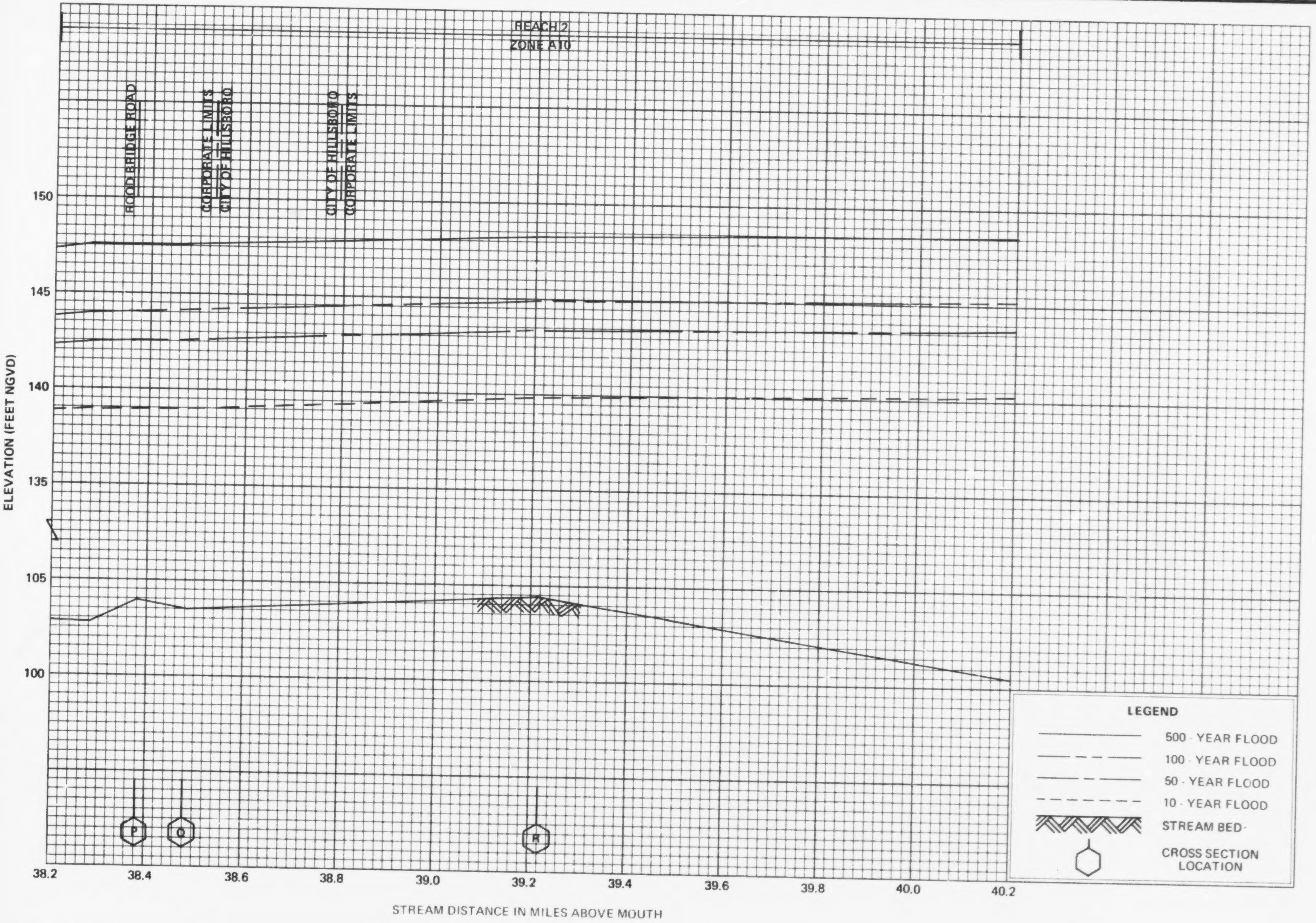

FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

08P

62

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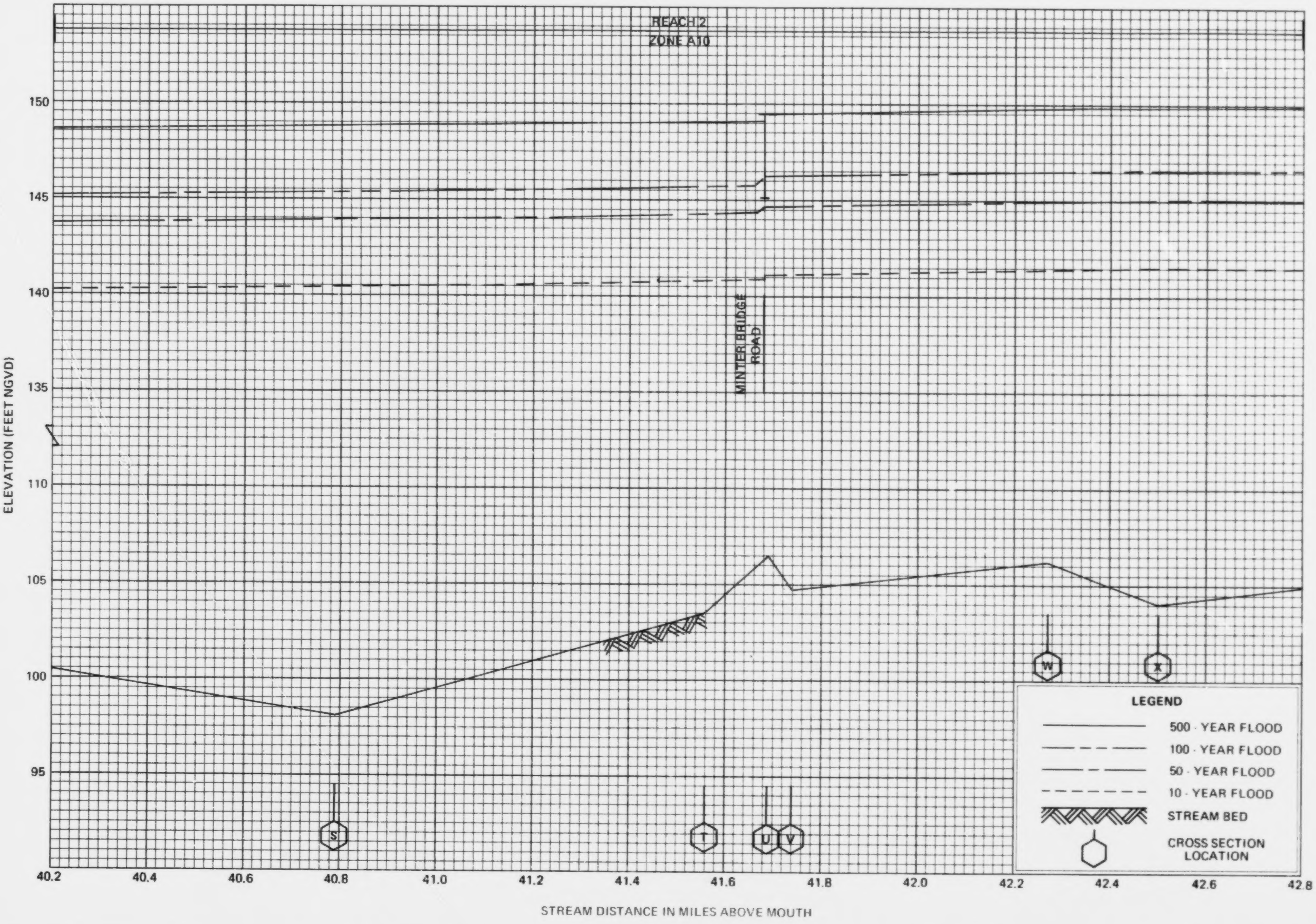


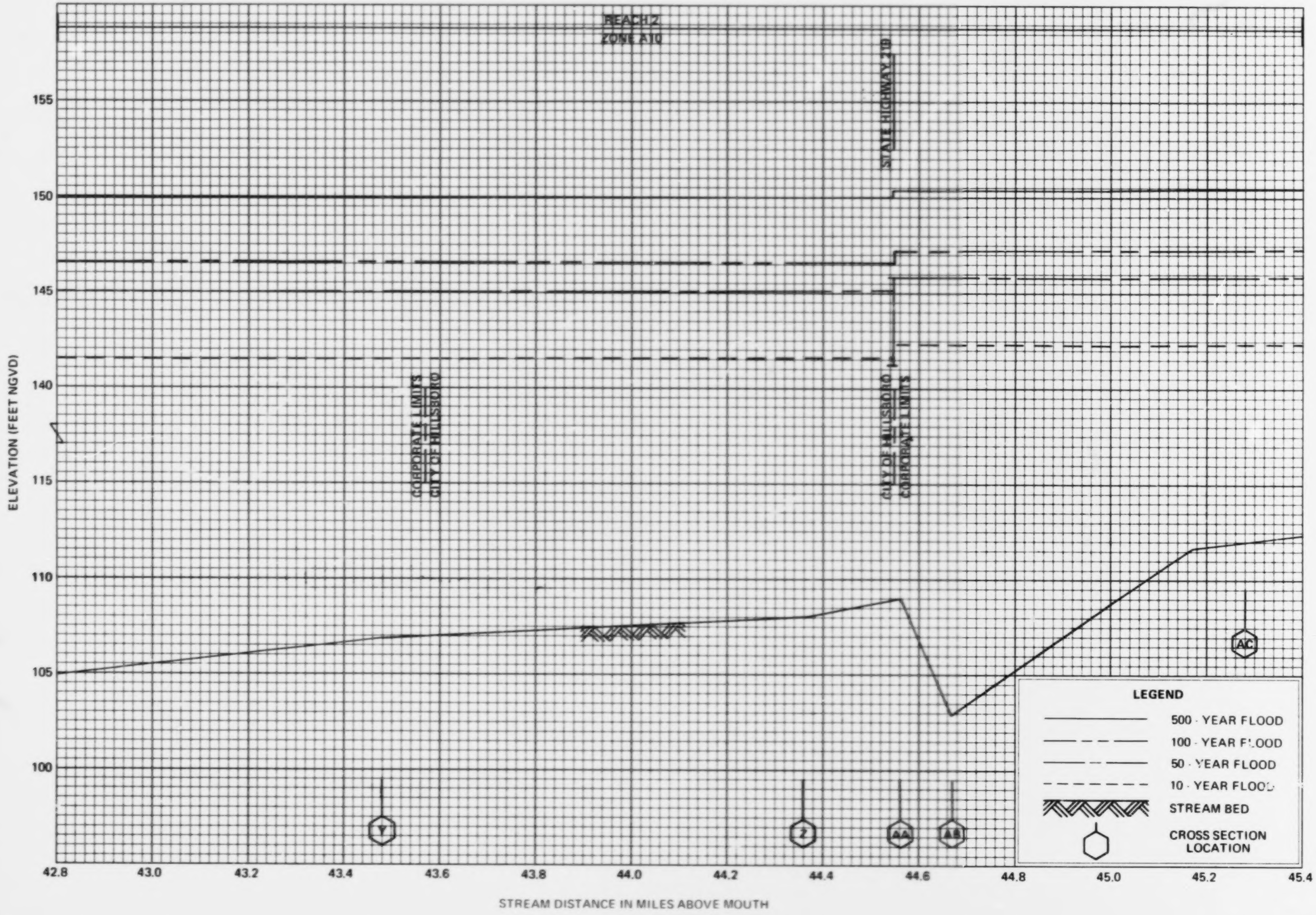
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

FLOOD PROFILES

TUALATIN RIVER

09P



FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

10P

64

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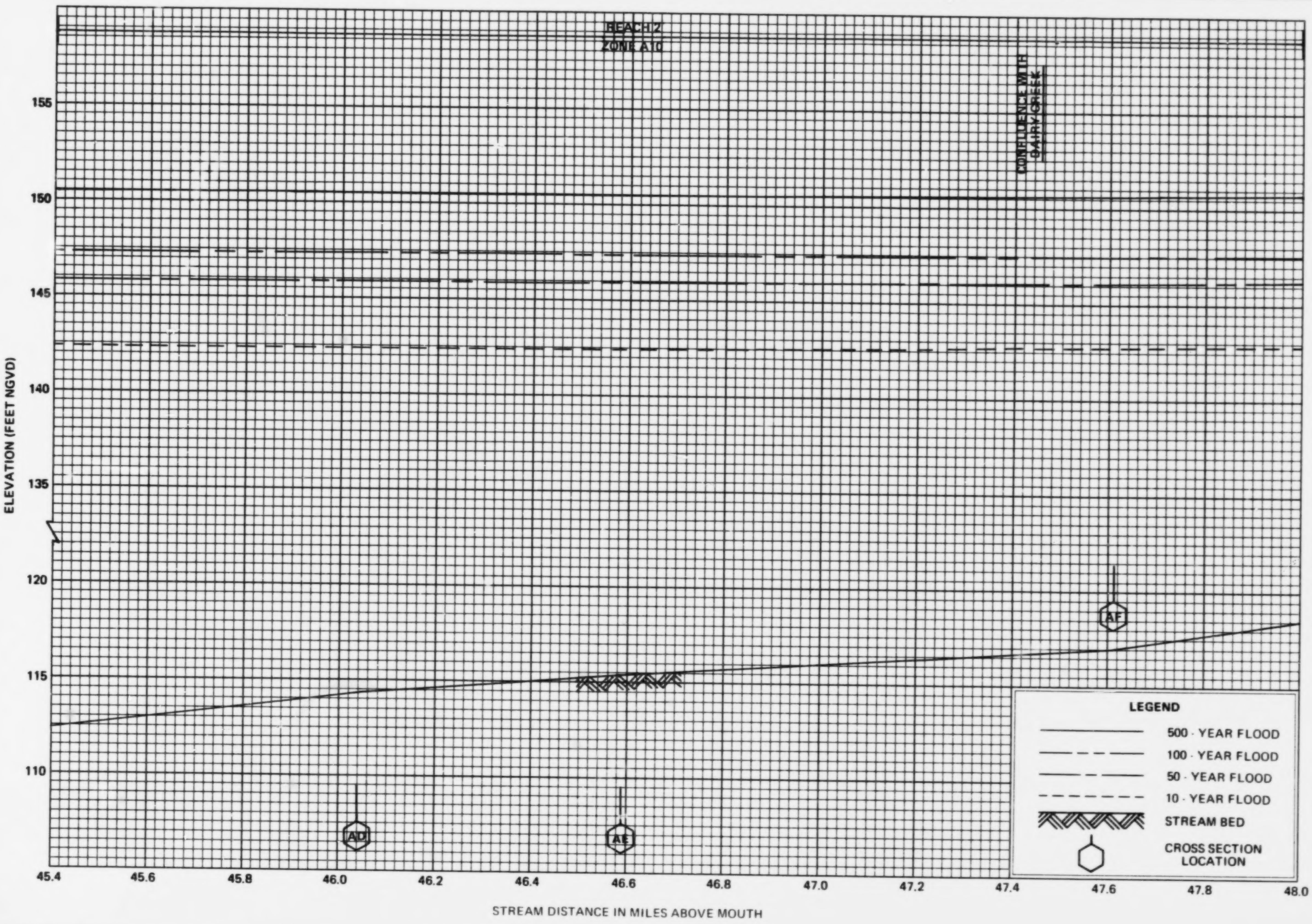

FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

11P

65

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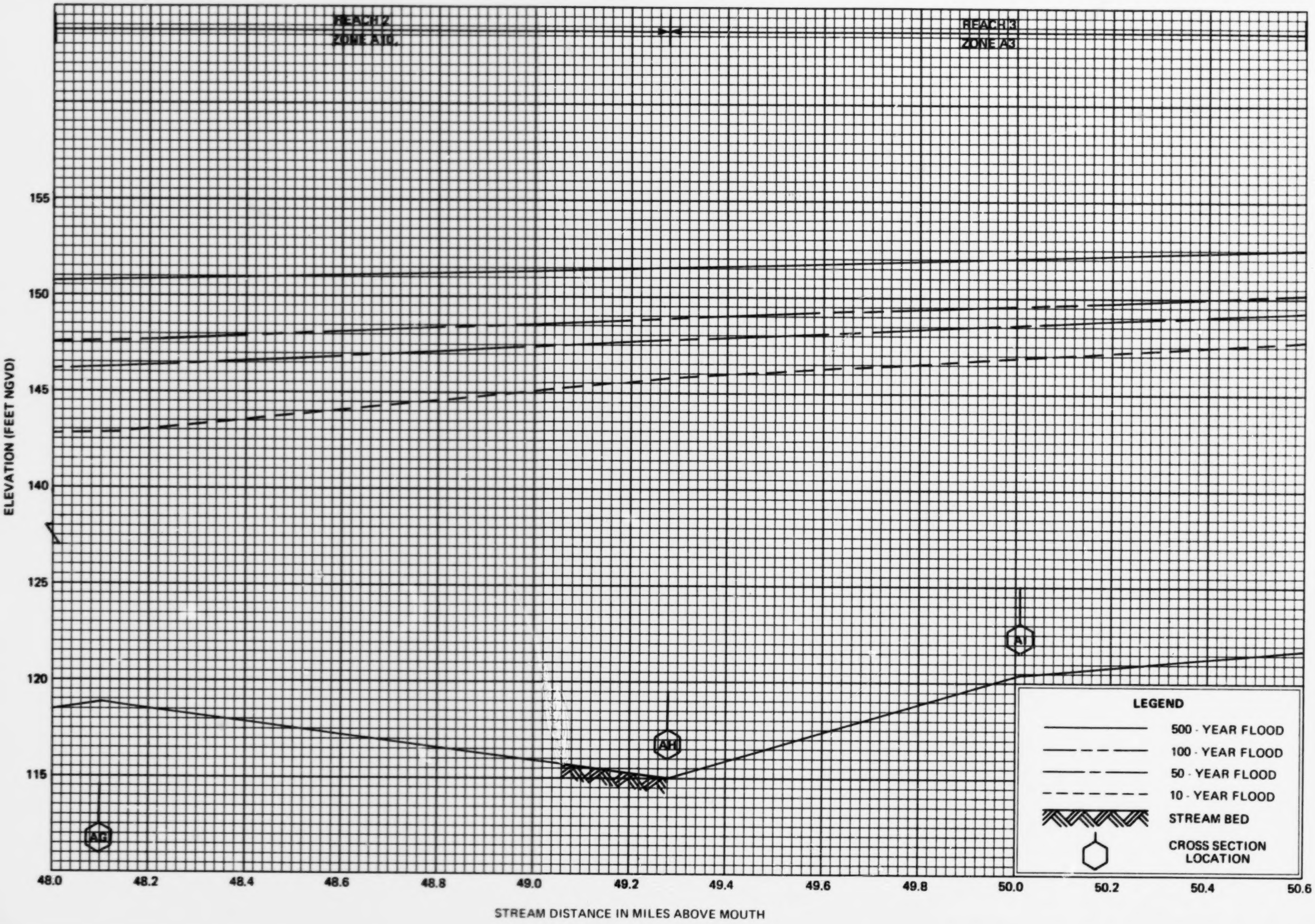


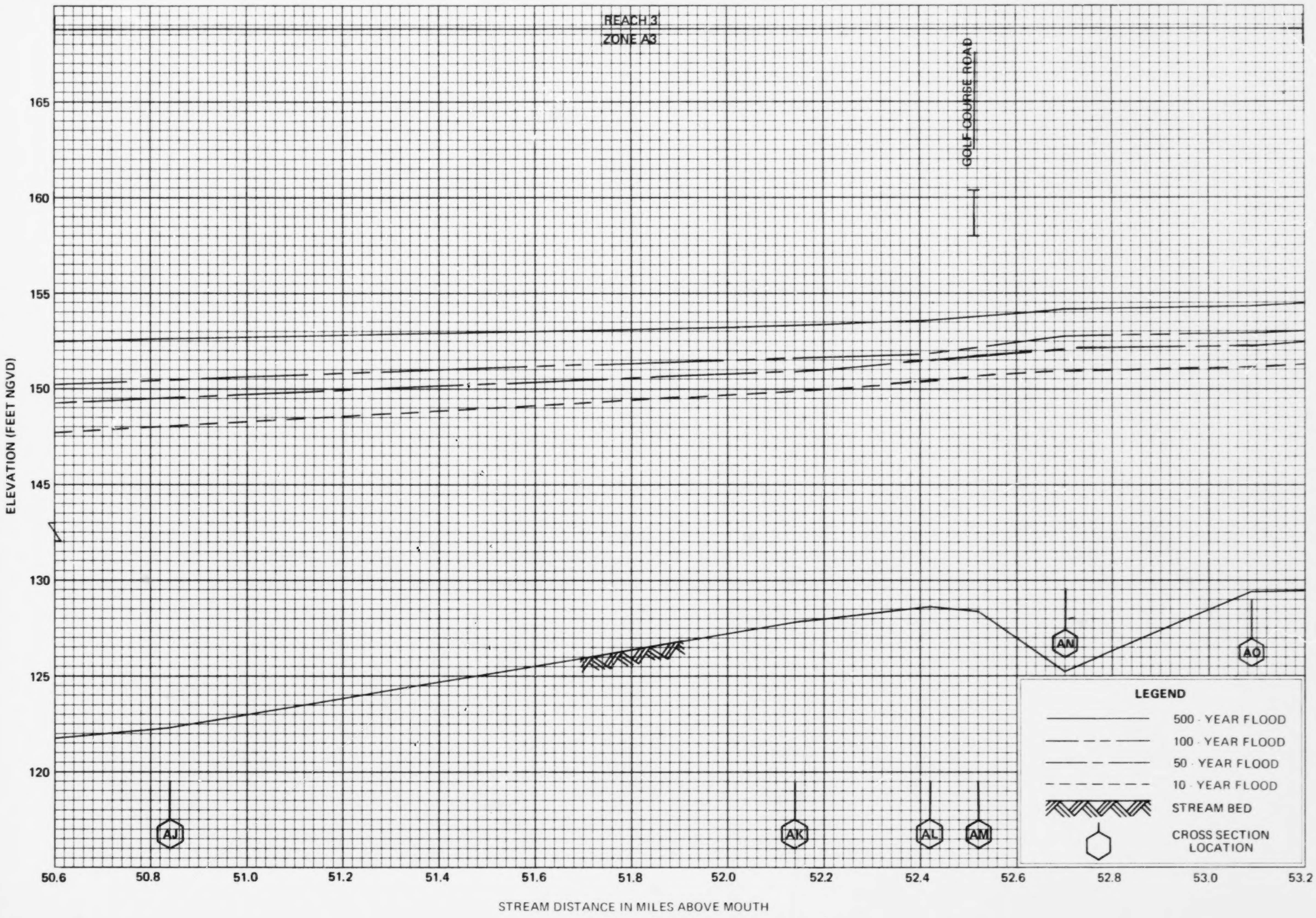
FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

12P



FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

67

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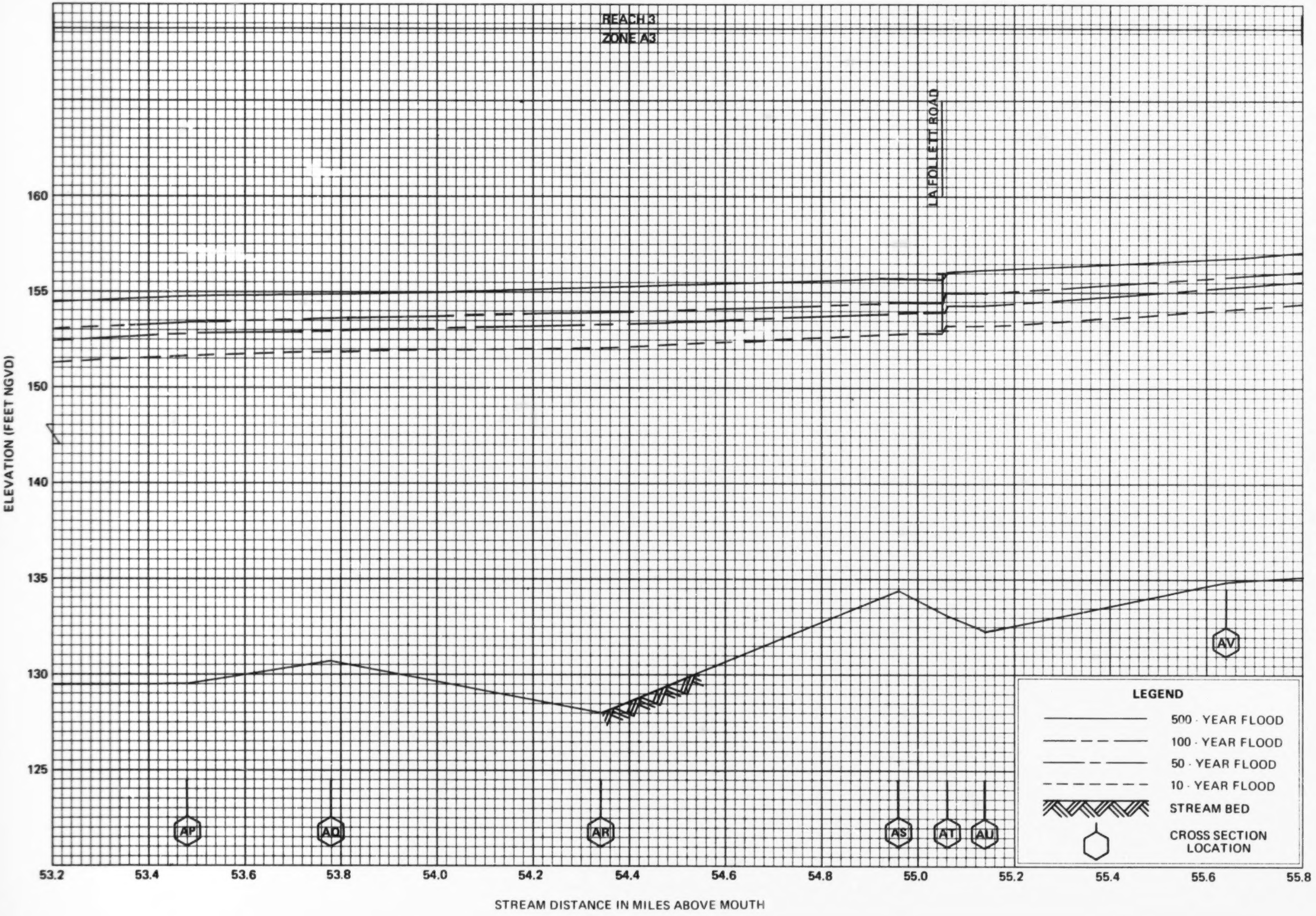
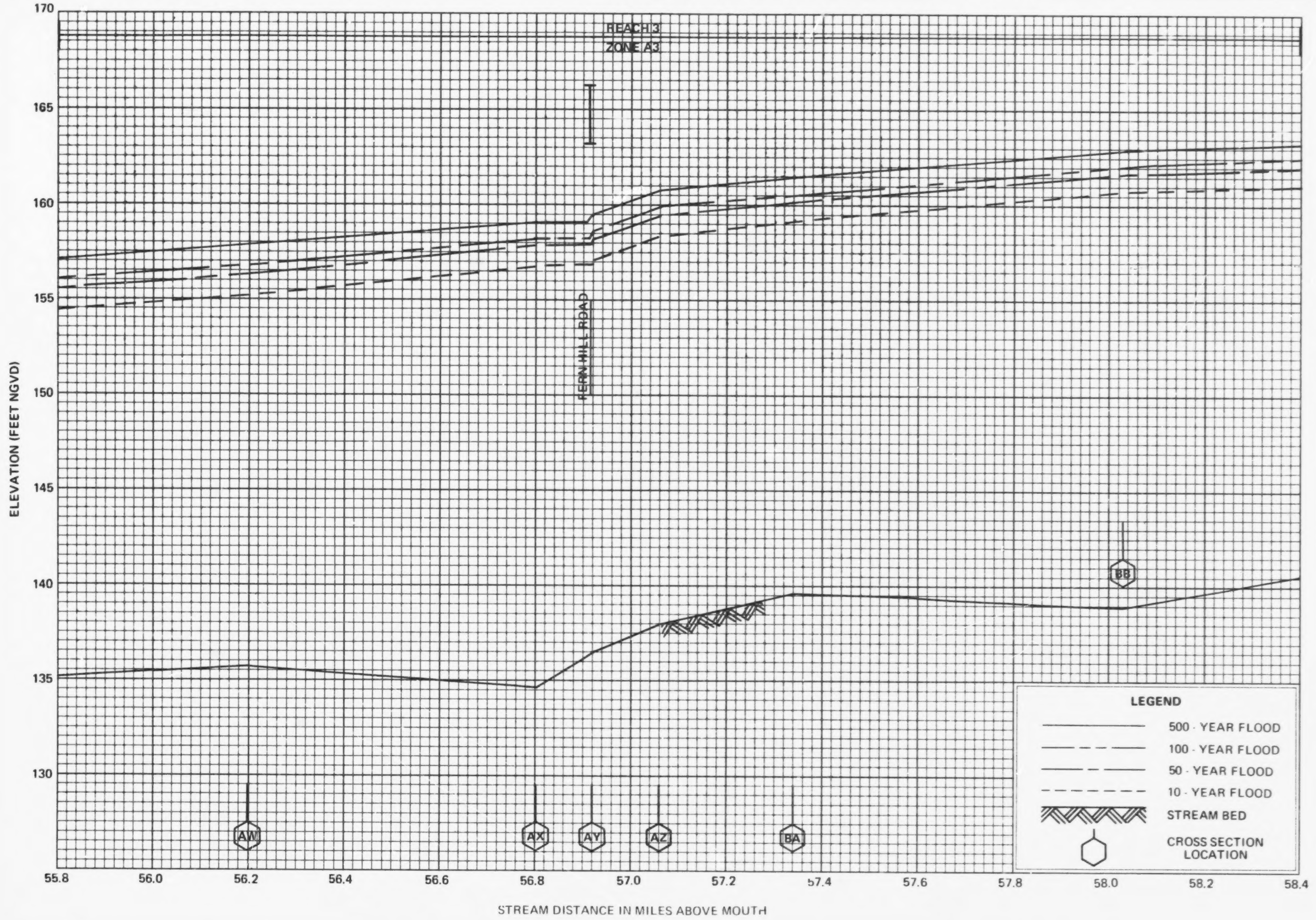


FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)



FLOOD PROFILES

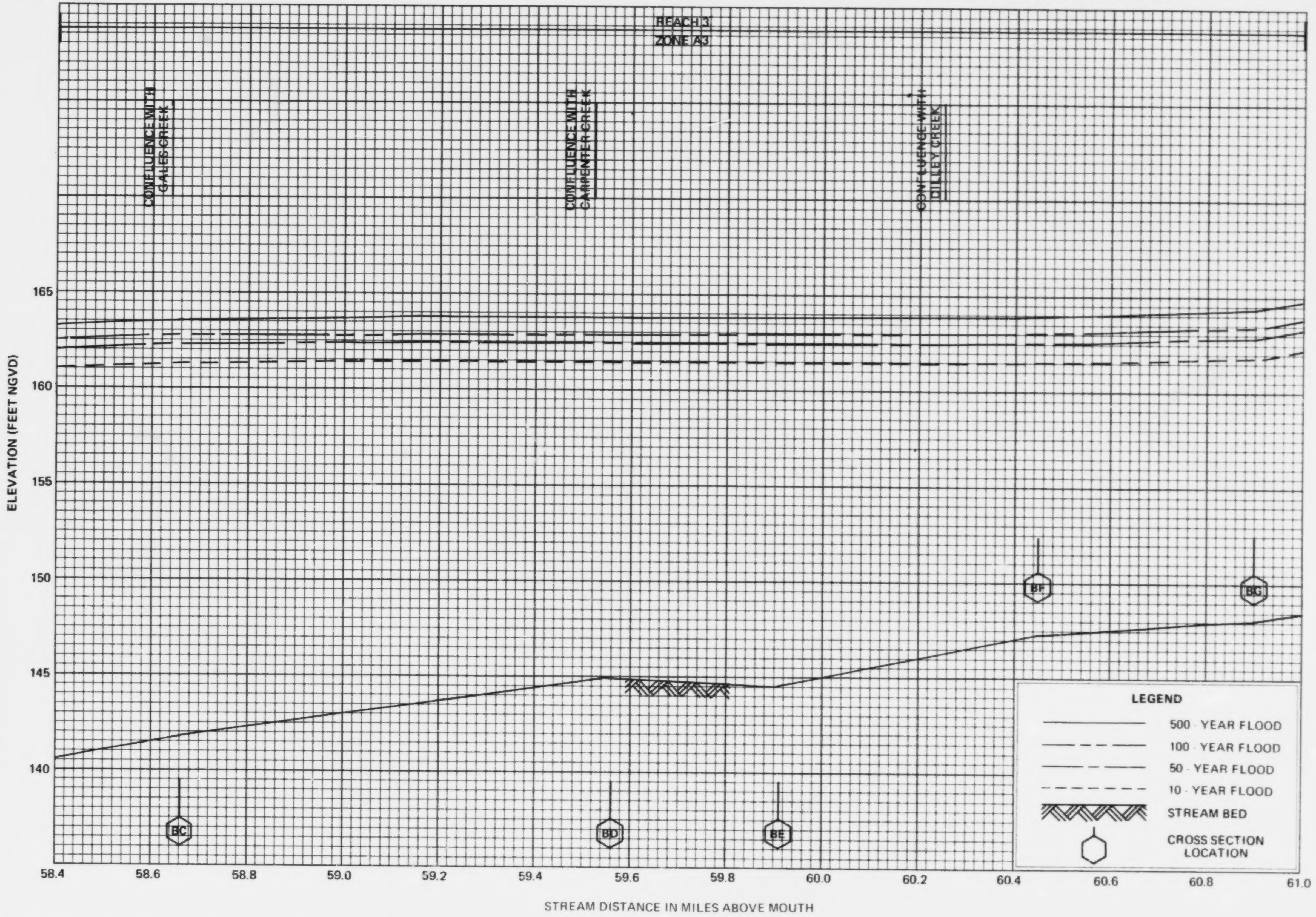
TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

15P

69



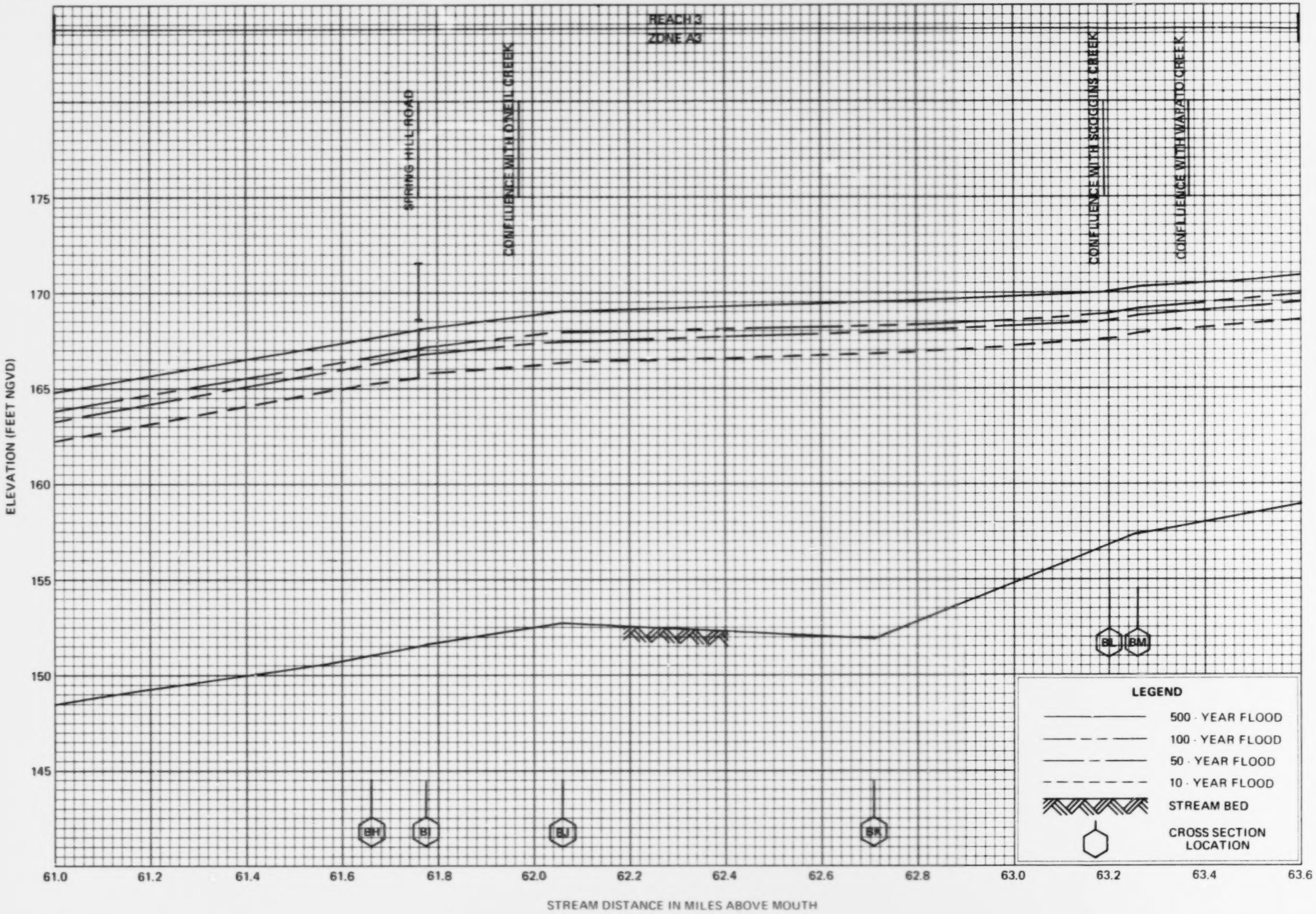
FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

16P



FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

17P

71

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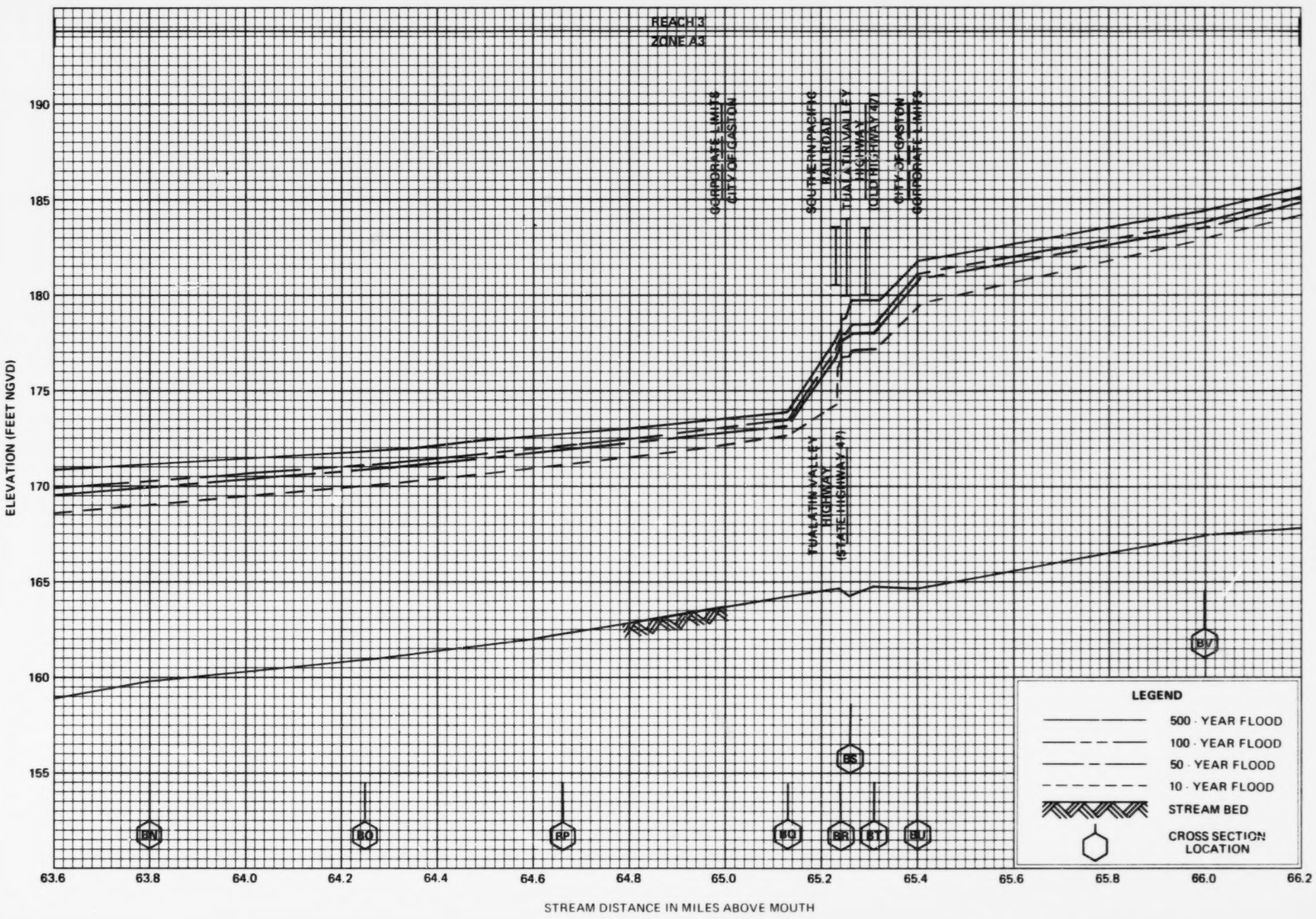

FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

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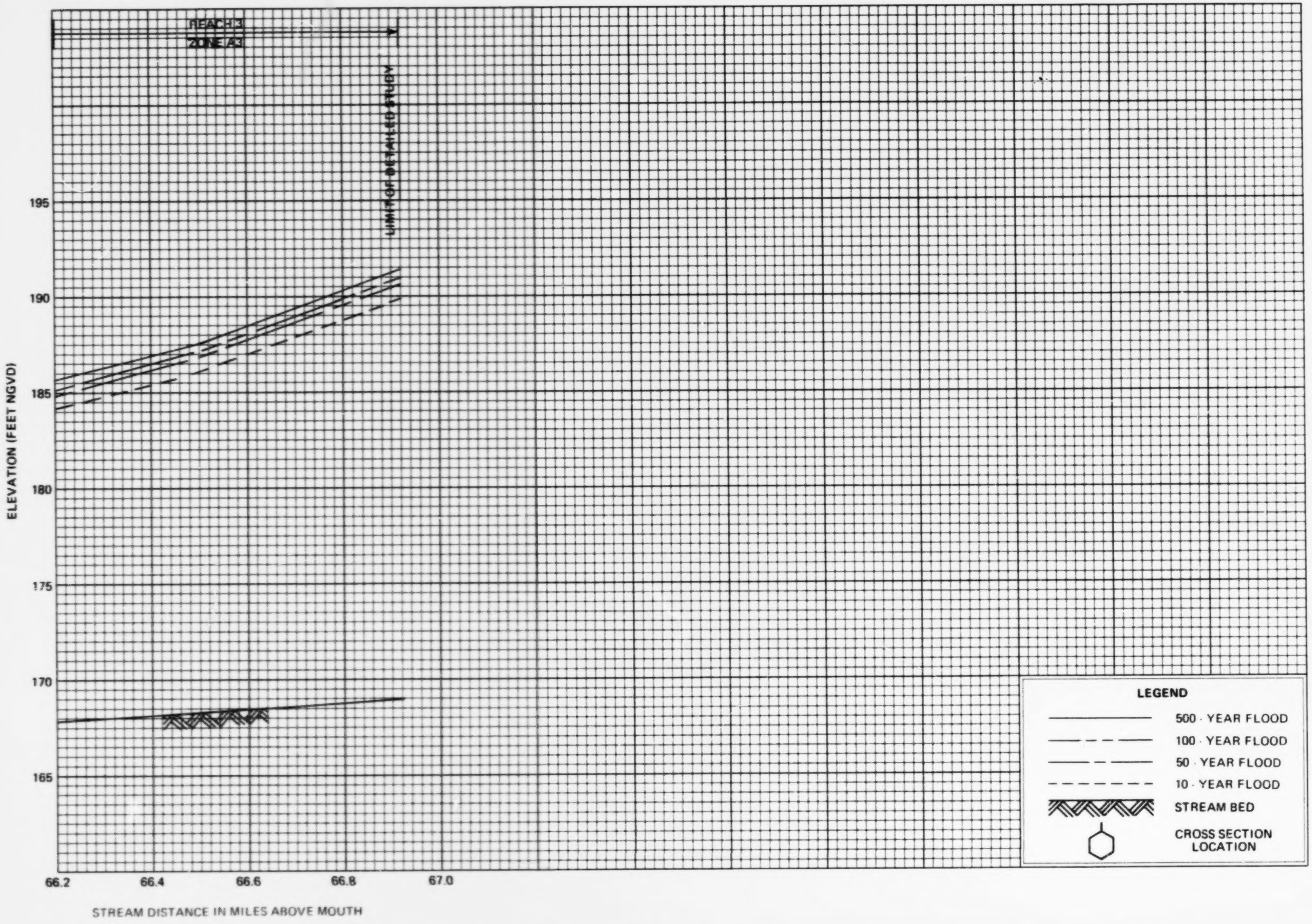
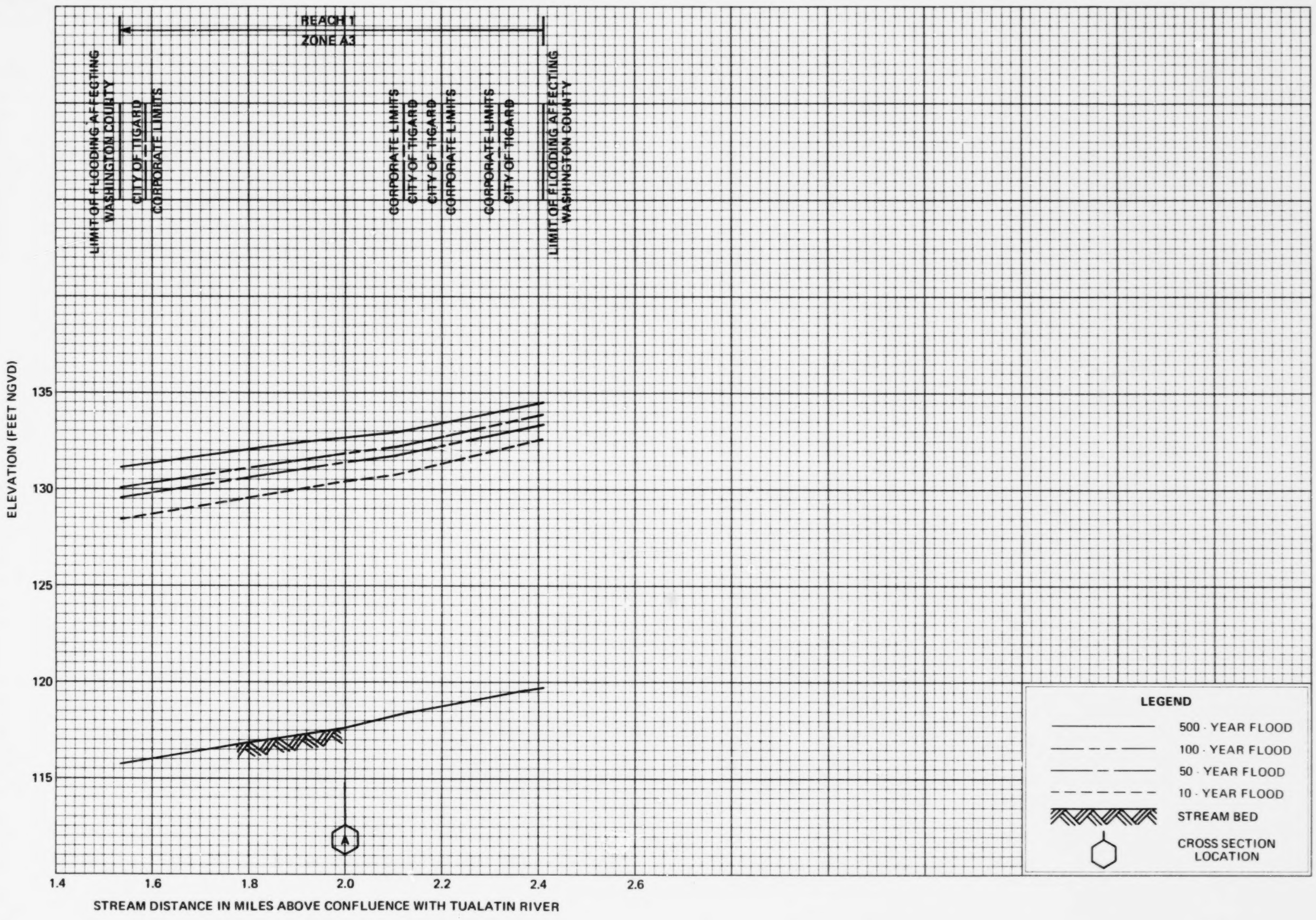


FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)



FLOOD PROFILES

FANNO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

20P

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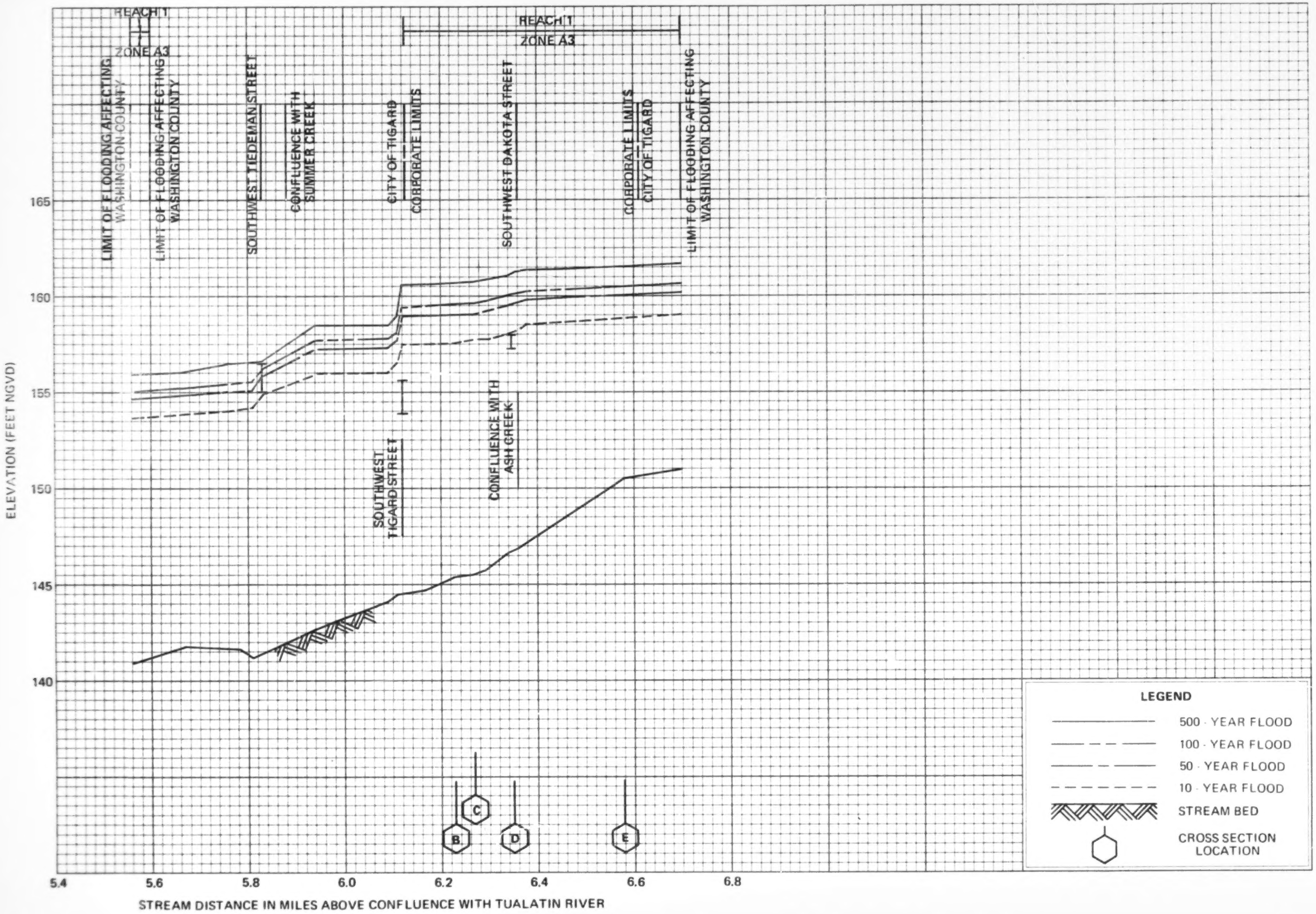
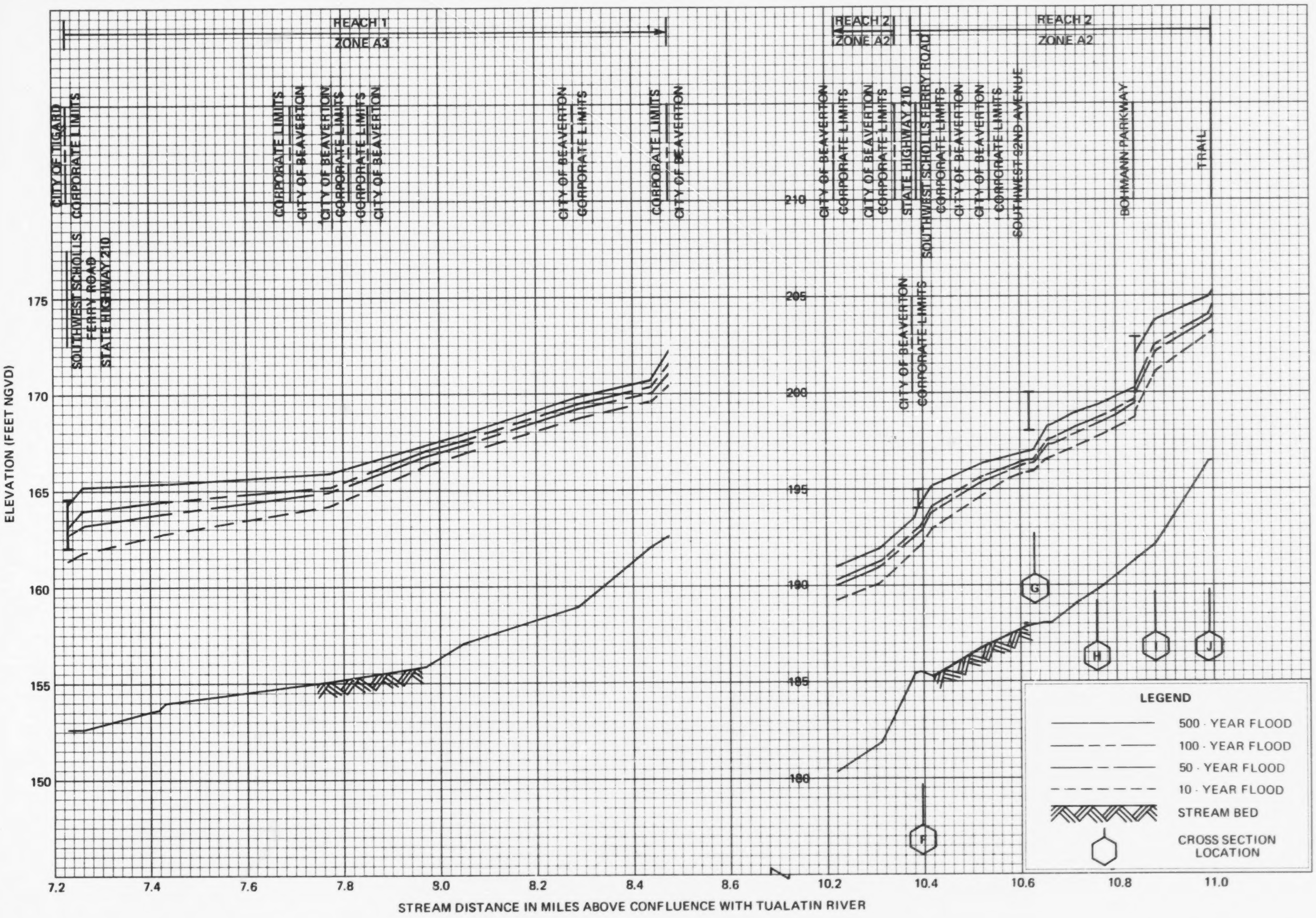


FLOOD PROFILES

FANNO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

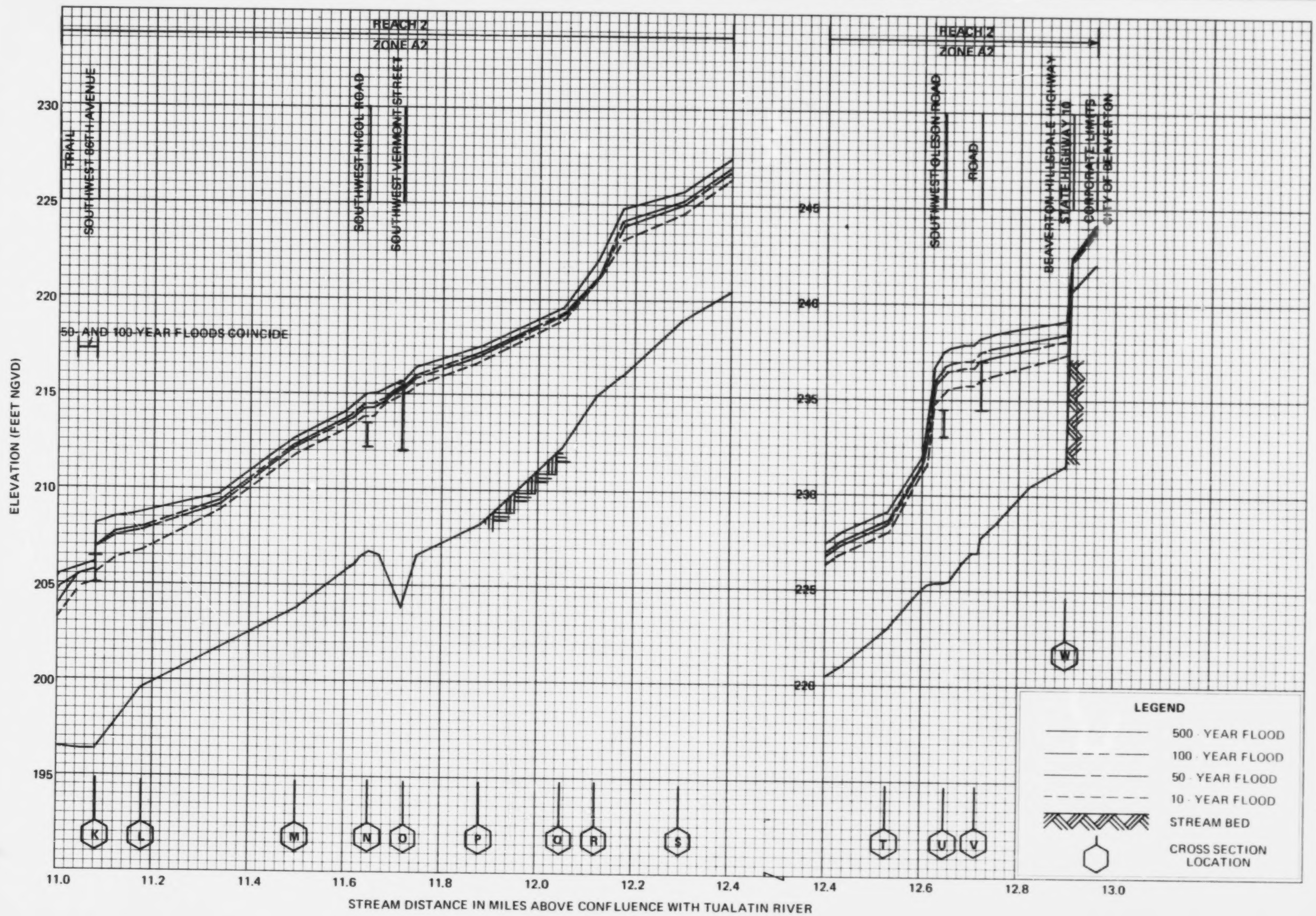


FLOOD PROFILES

FANNO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)



FLOOD PROFILES

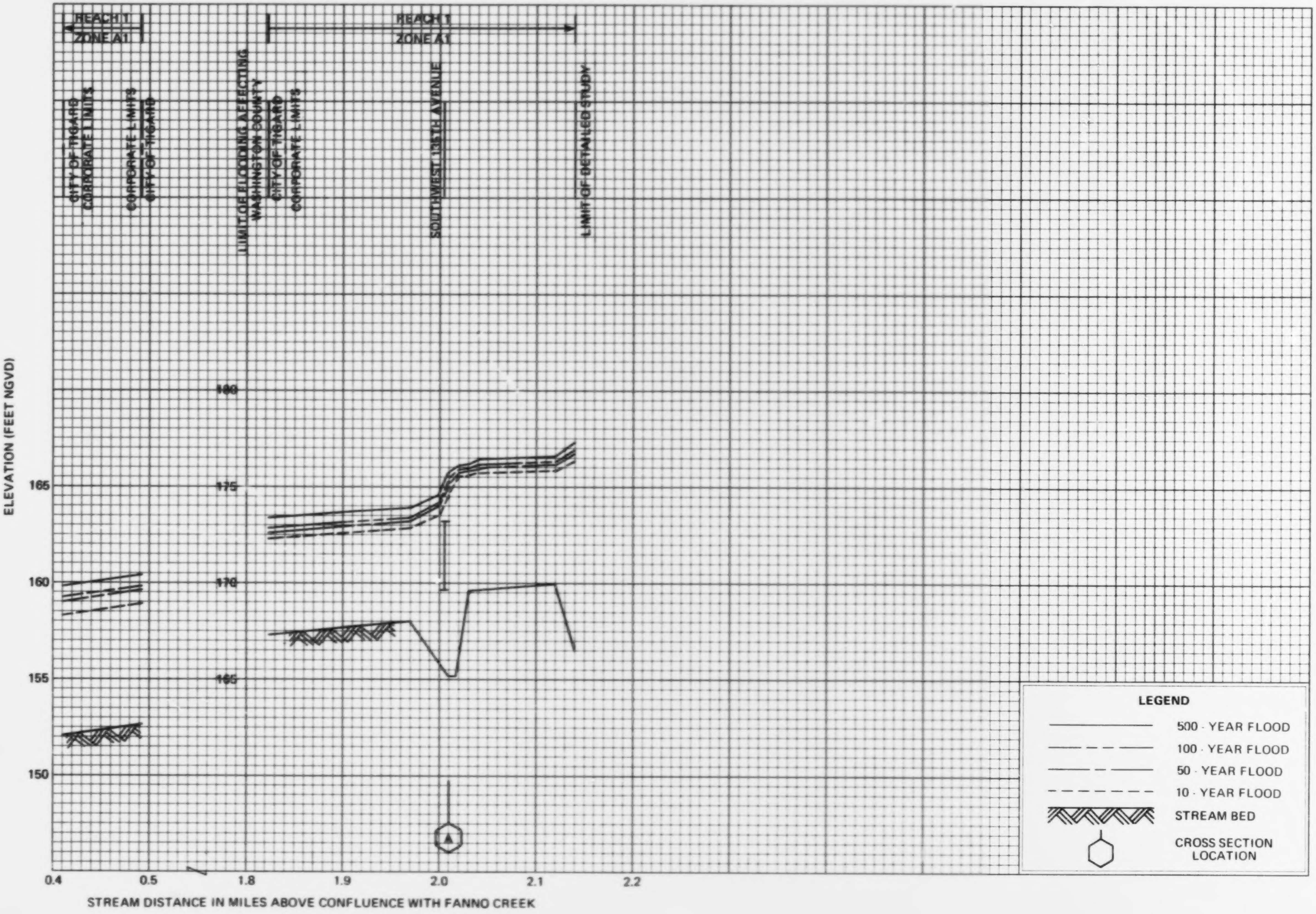
FANNO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

23P

77



FLOOD PROFILES

SUMMER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

24P

78

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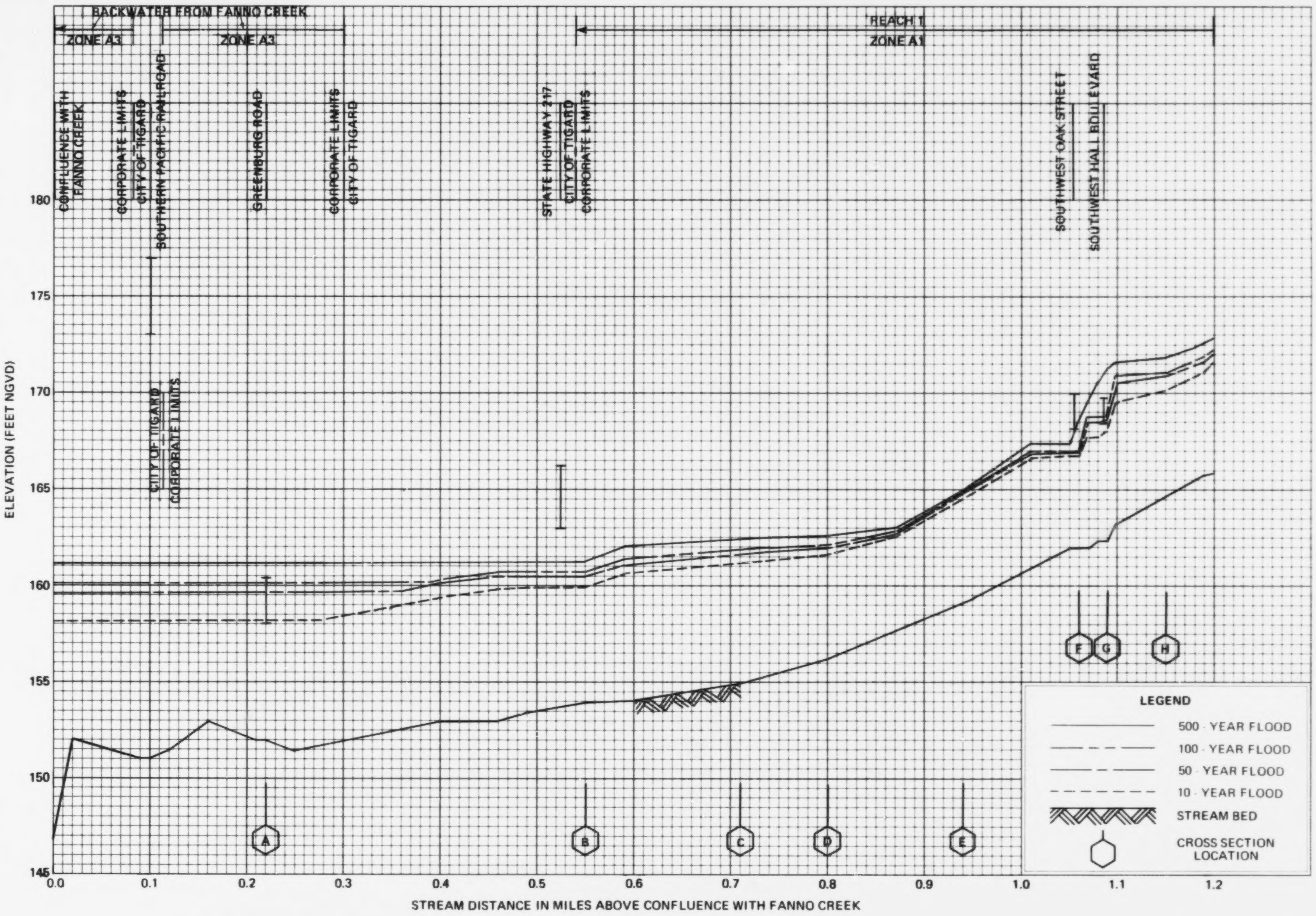

FLOOD PROFILES

ASH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

25P

79

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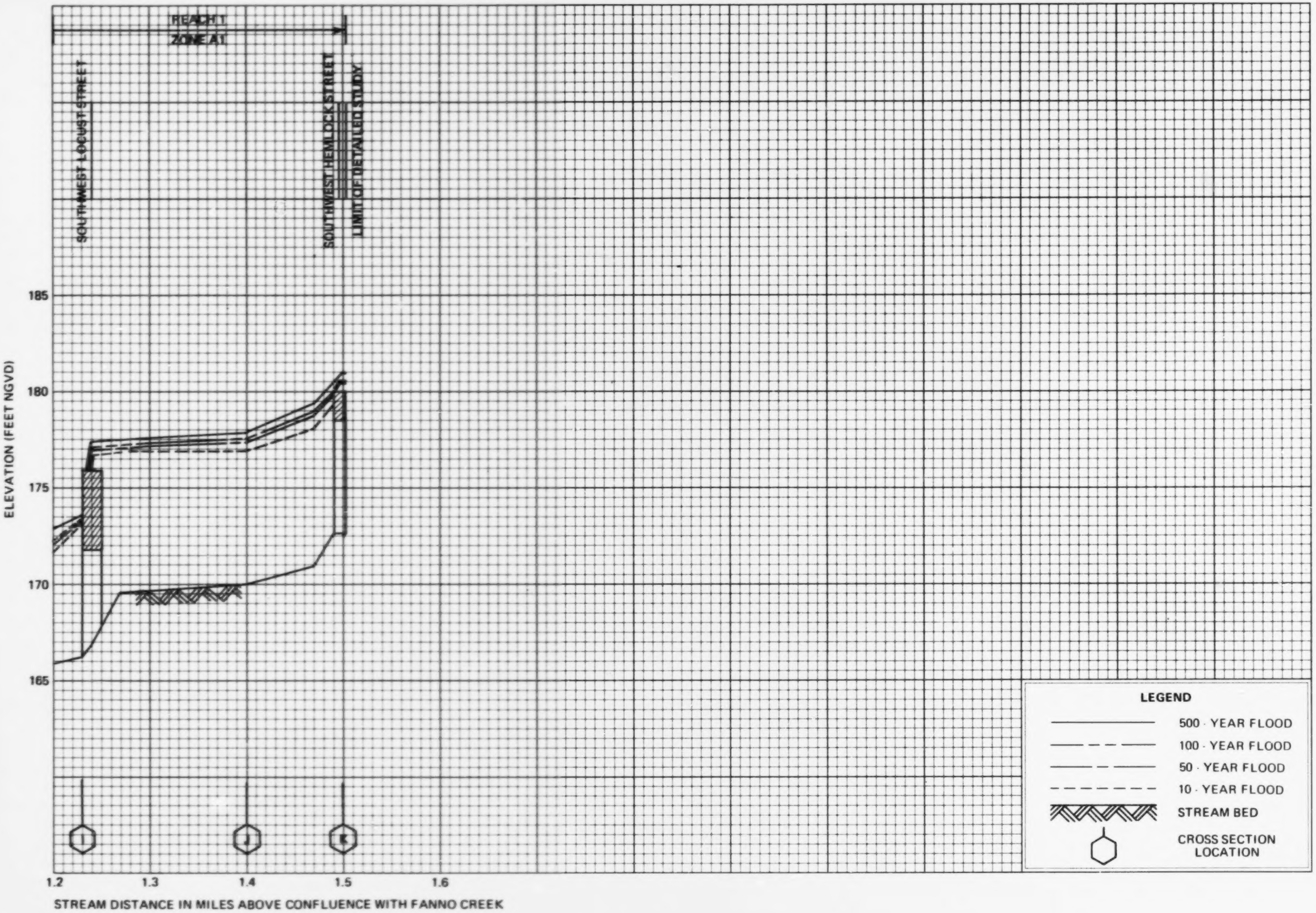

FLOOD PROFILES

ASH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

26P

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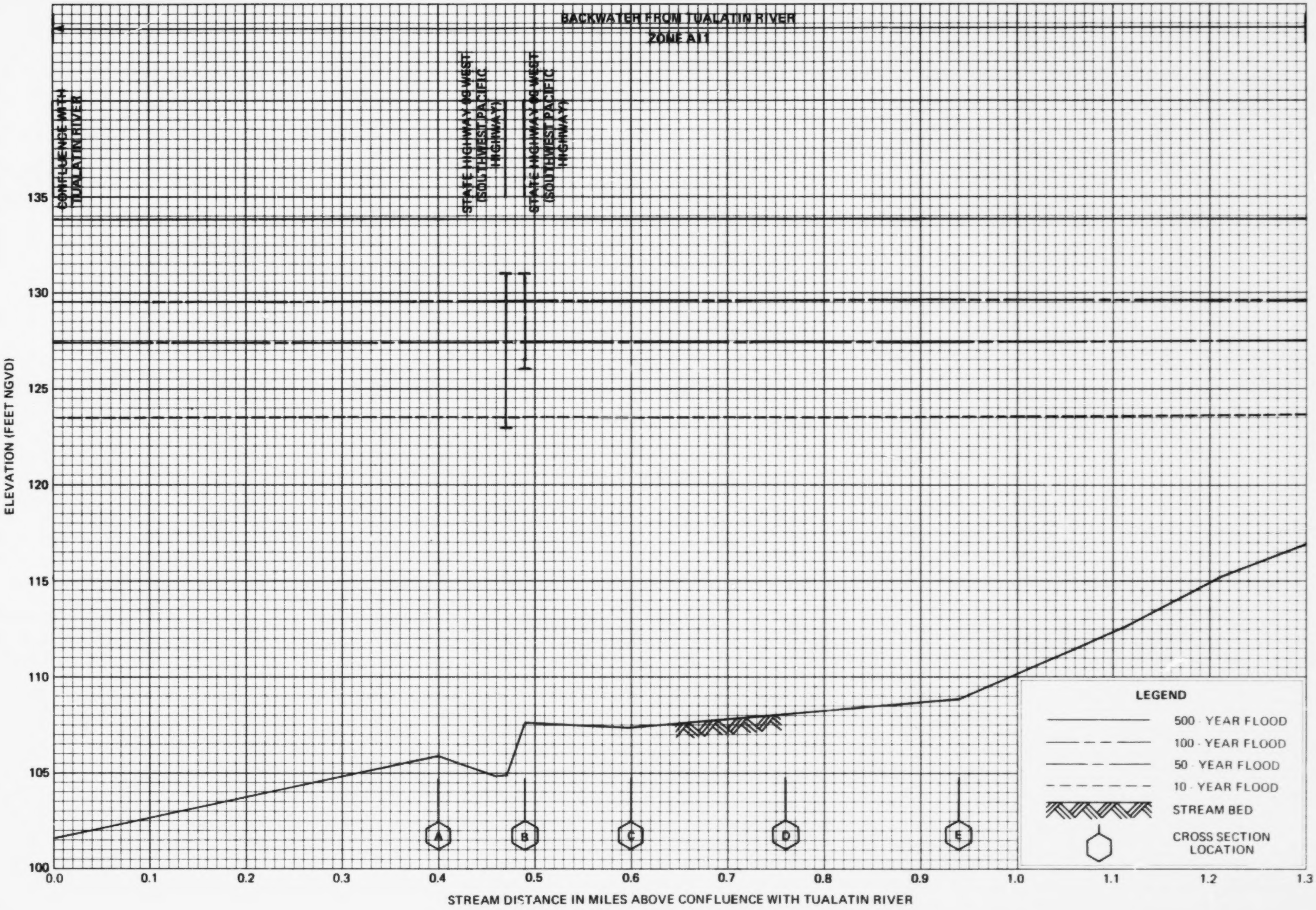

FLOOD PROFILES

ROCK CREEK (NEAR SHERWOOD)

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

81

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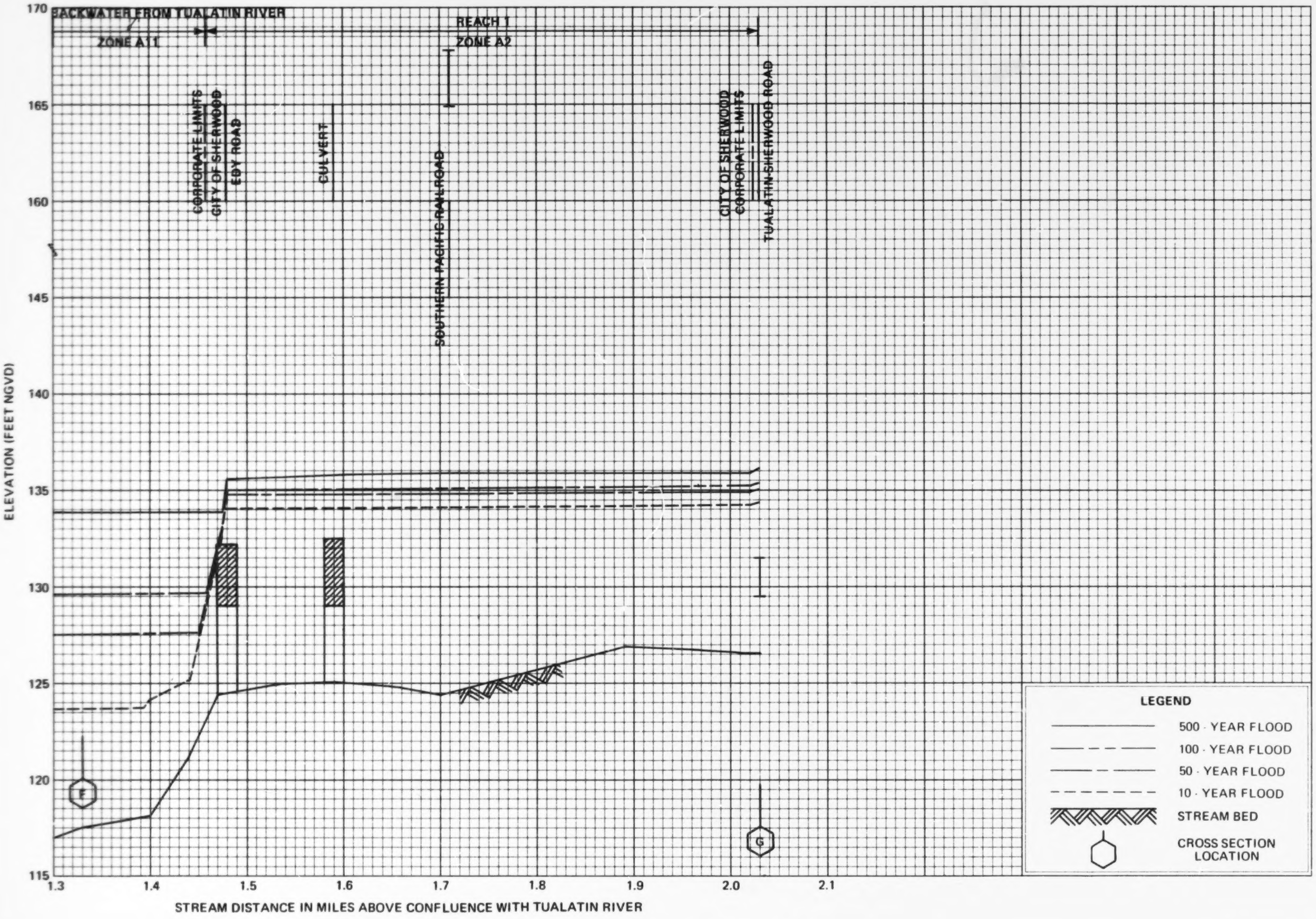

FLOOD PROFILES

ROCK CREEK (NEAR SHERWOOD)

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

28P

82

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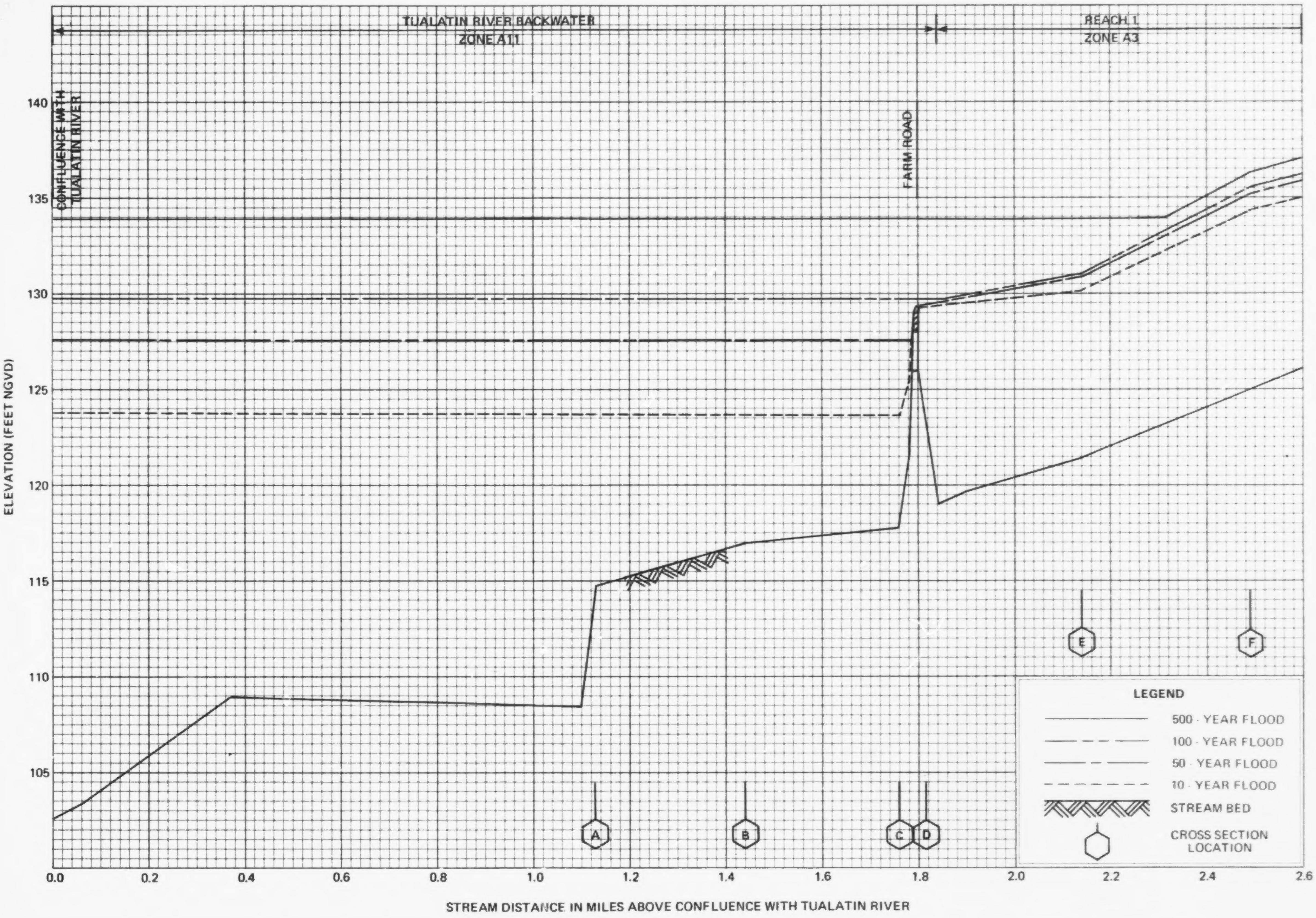


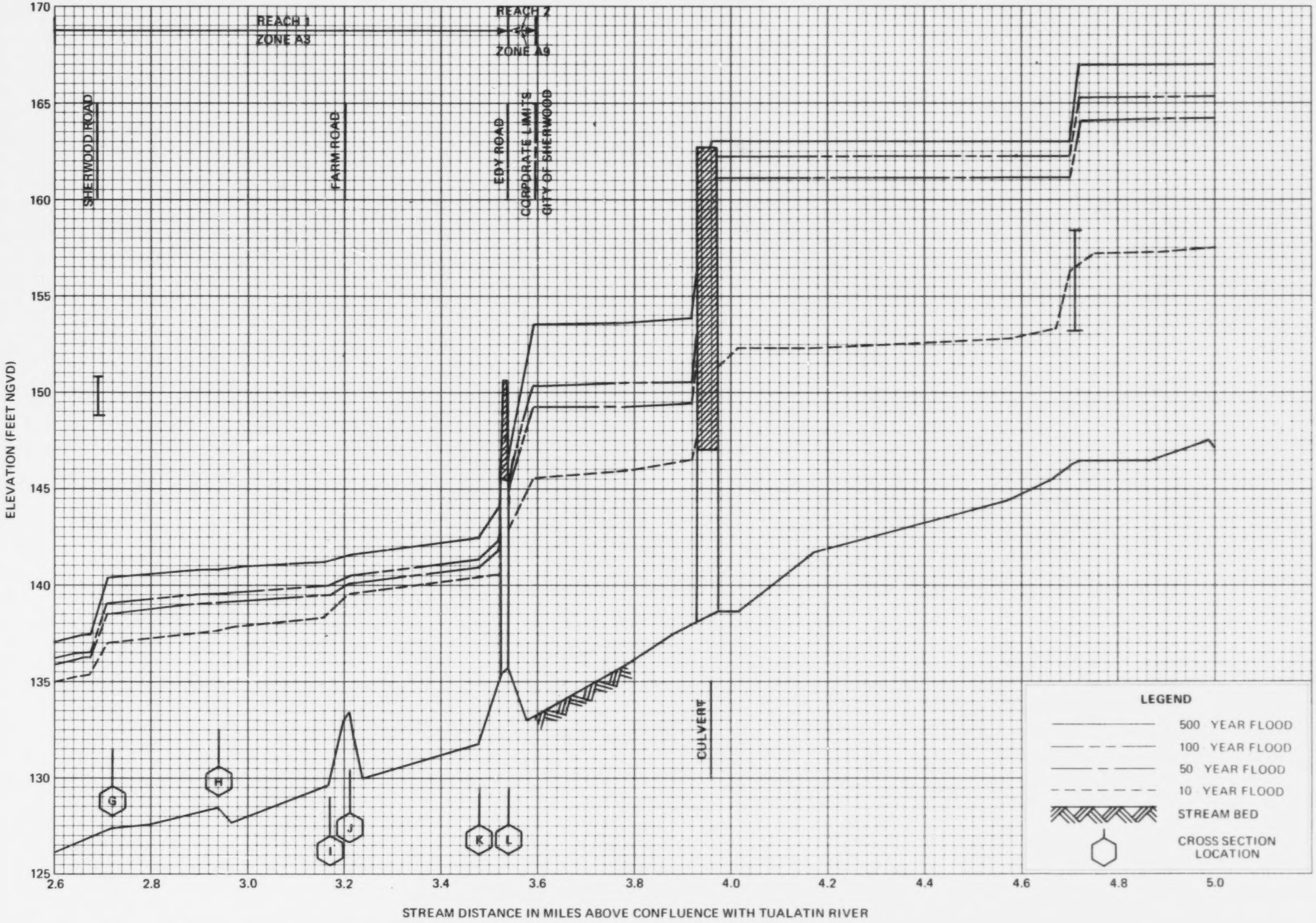
FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

29P



FLOOD PROFILES

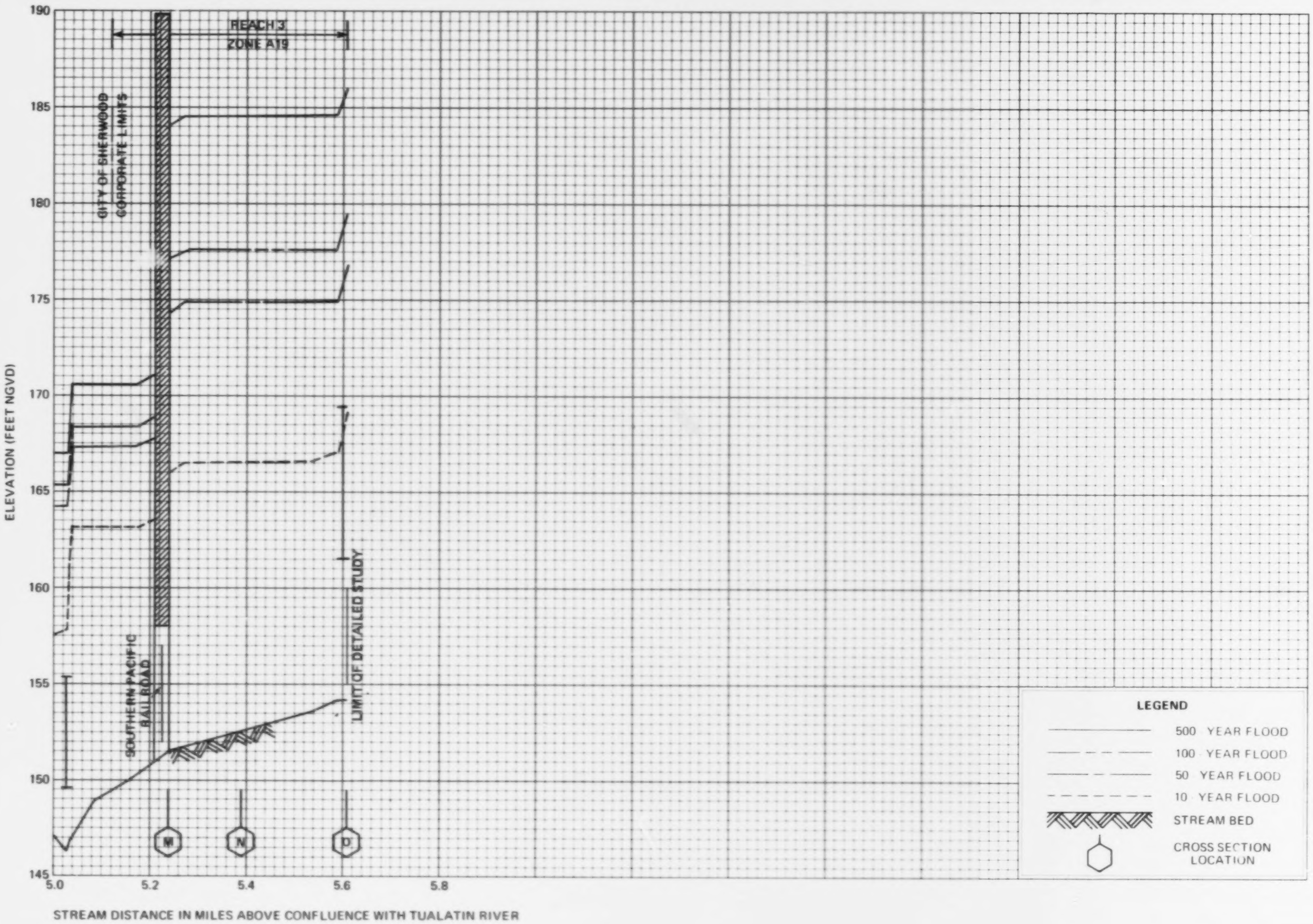
CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

30P

84



FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

31P

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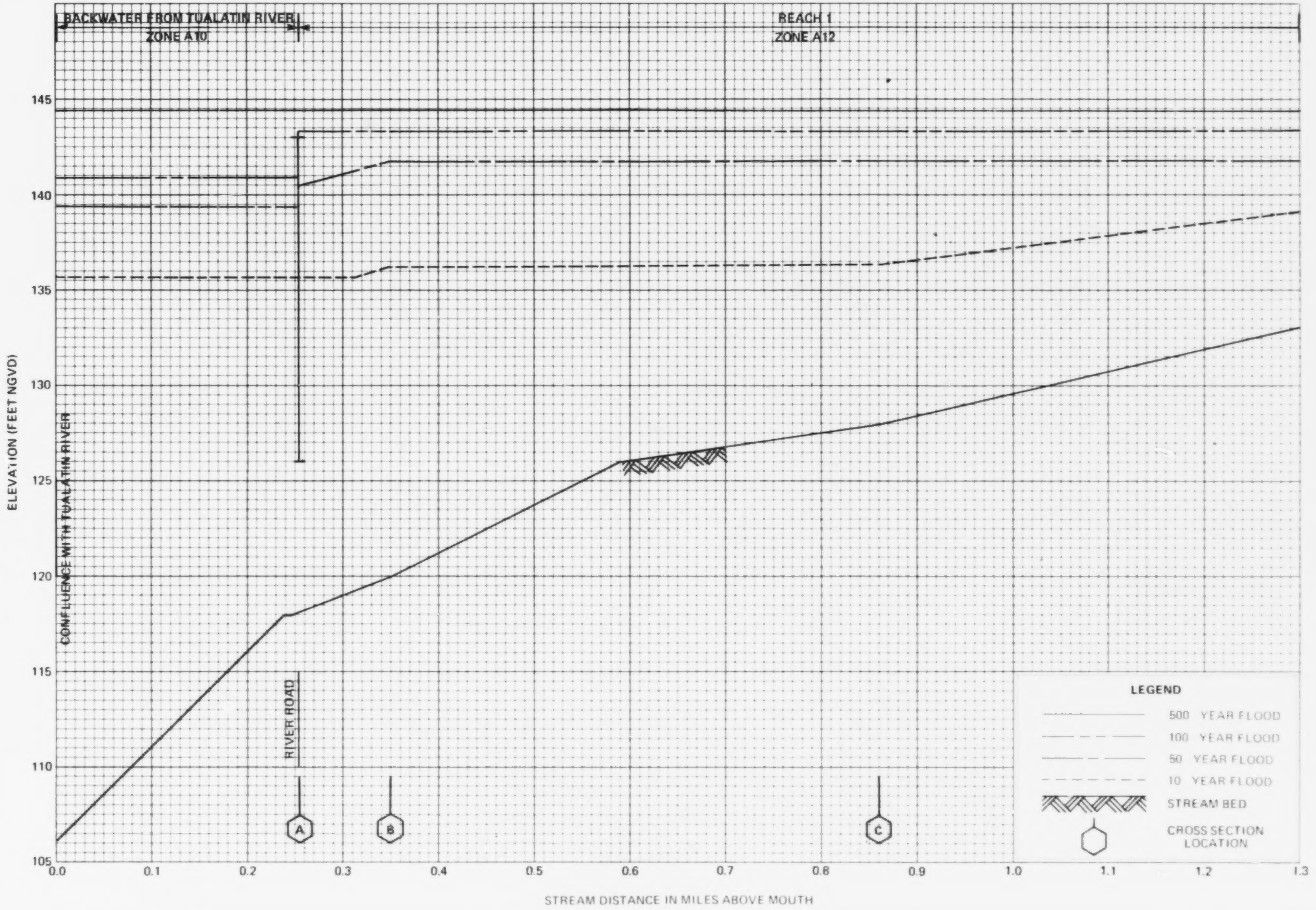
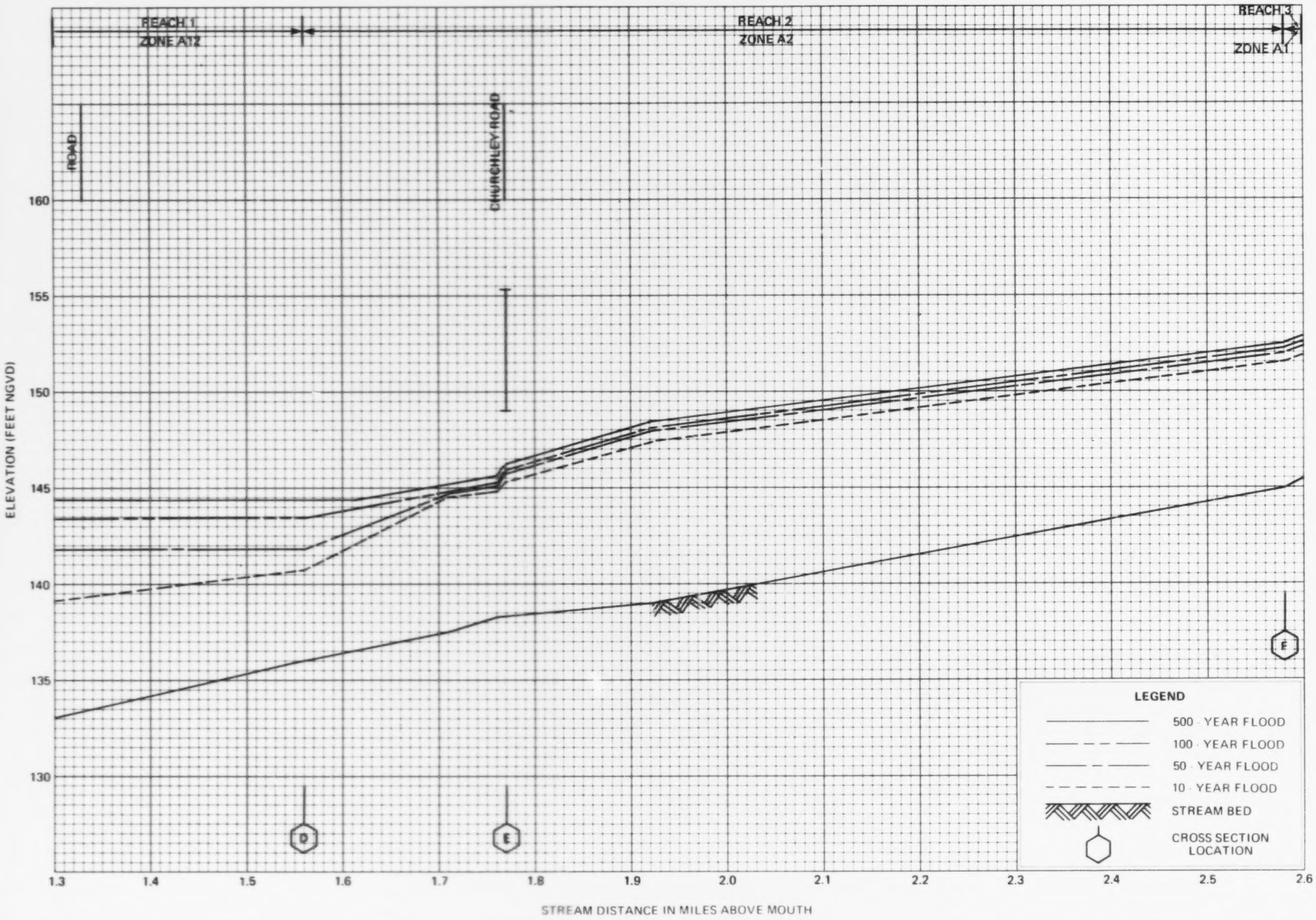


FLOOD PROFILES

BUTTERNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)



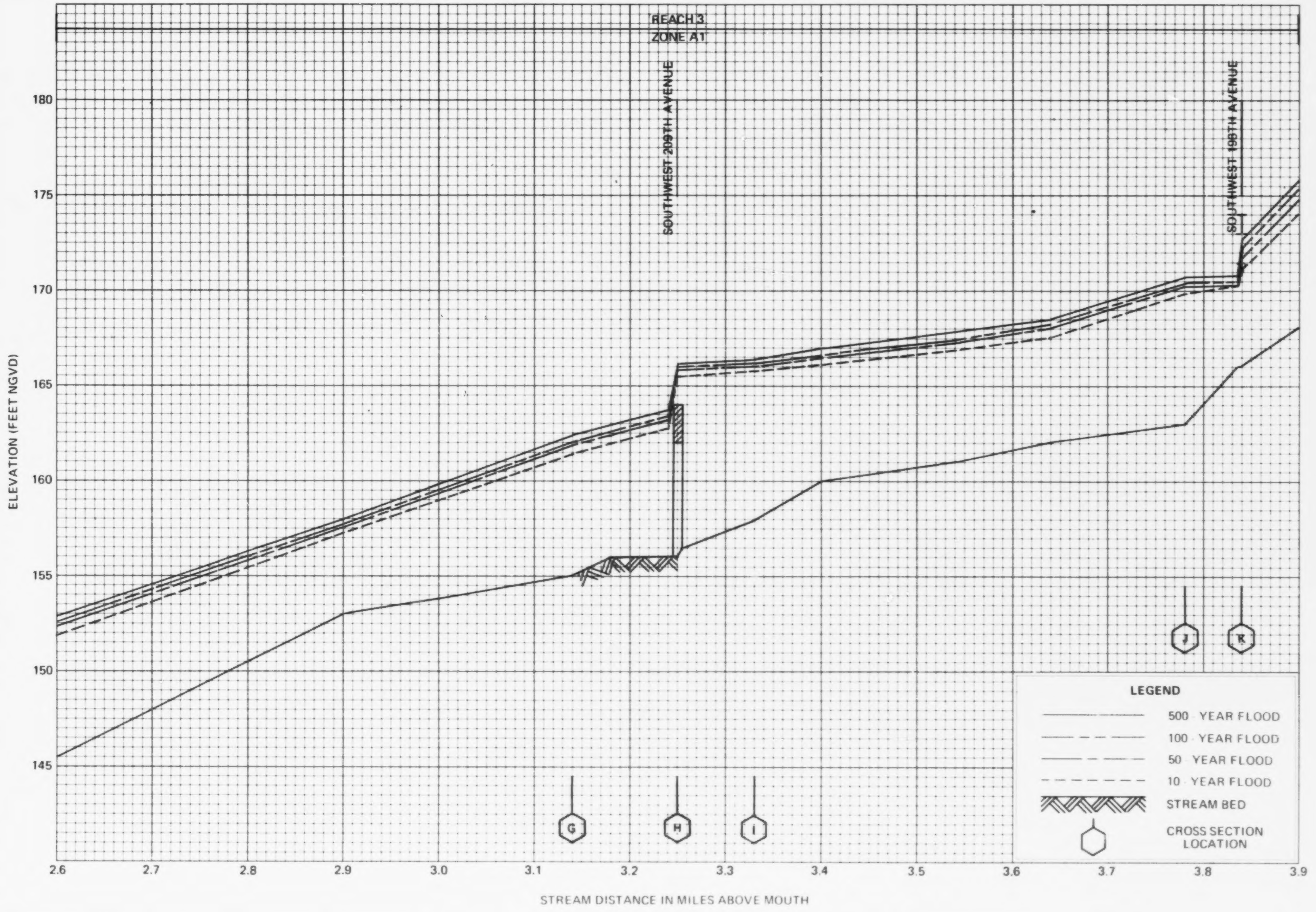
FLOOD PROFILES

BUTTERNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

33P



FLOOD PROFILES

BUTTERNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

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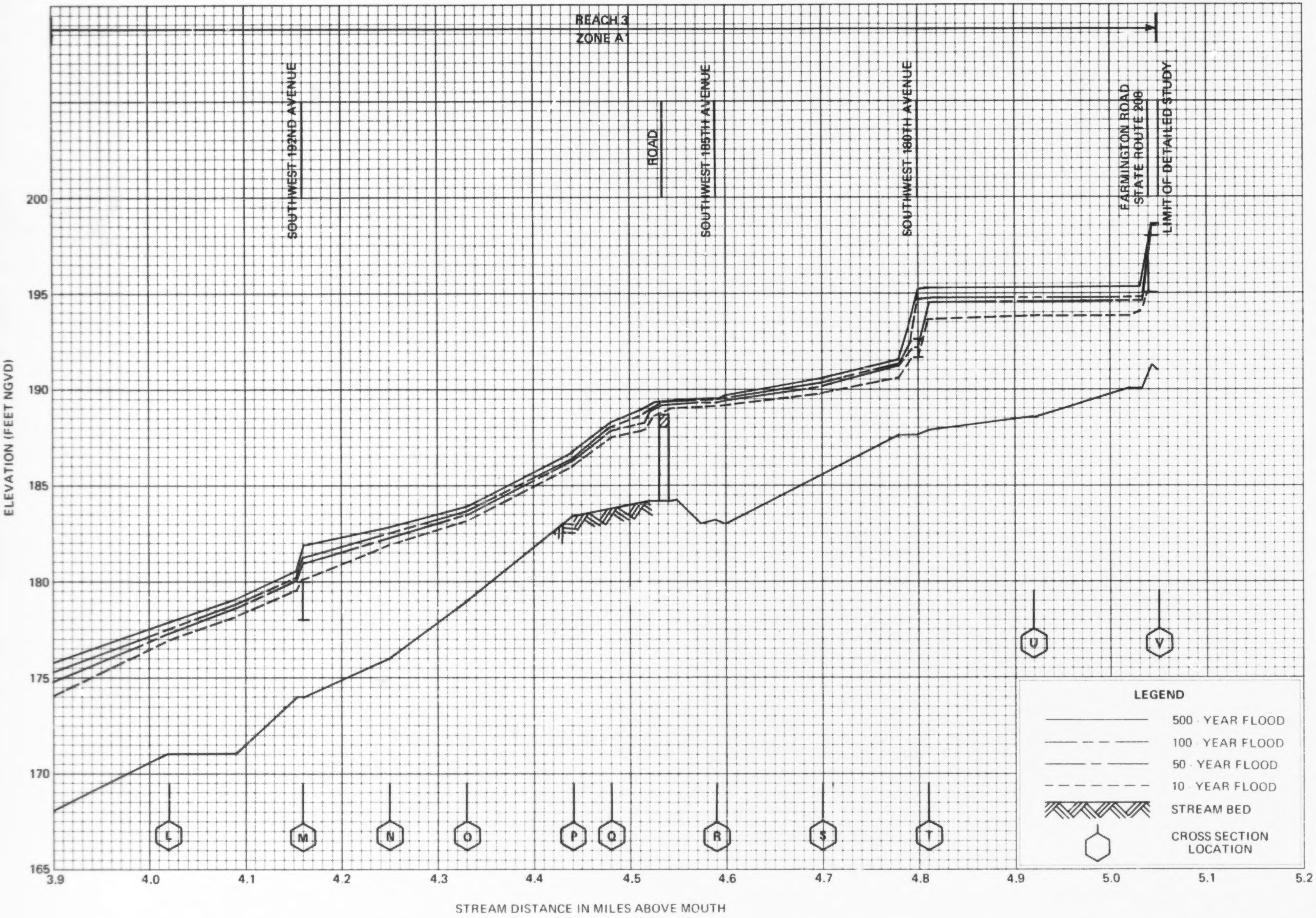
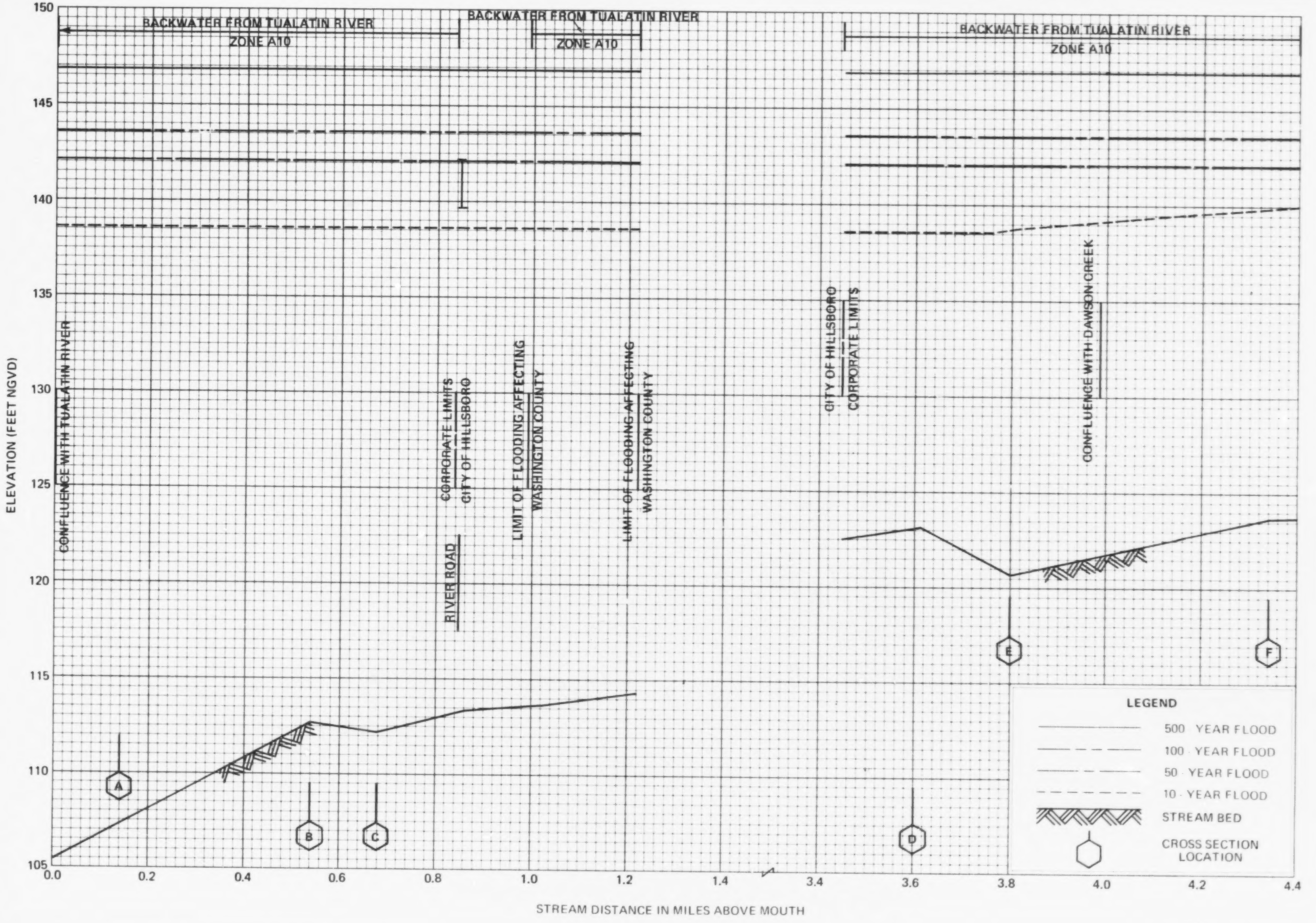


FLOOD PROFILES

BUTTERNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)



FLOOD PROFILES

ROCK CREEK (NEAR HILLSBORO)

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

36P

90

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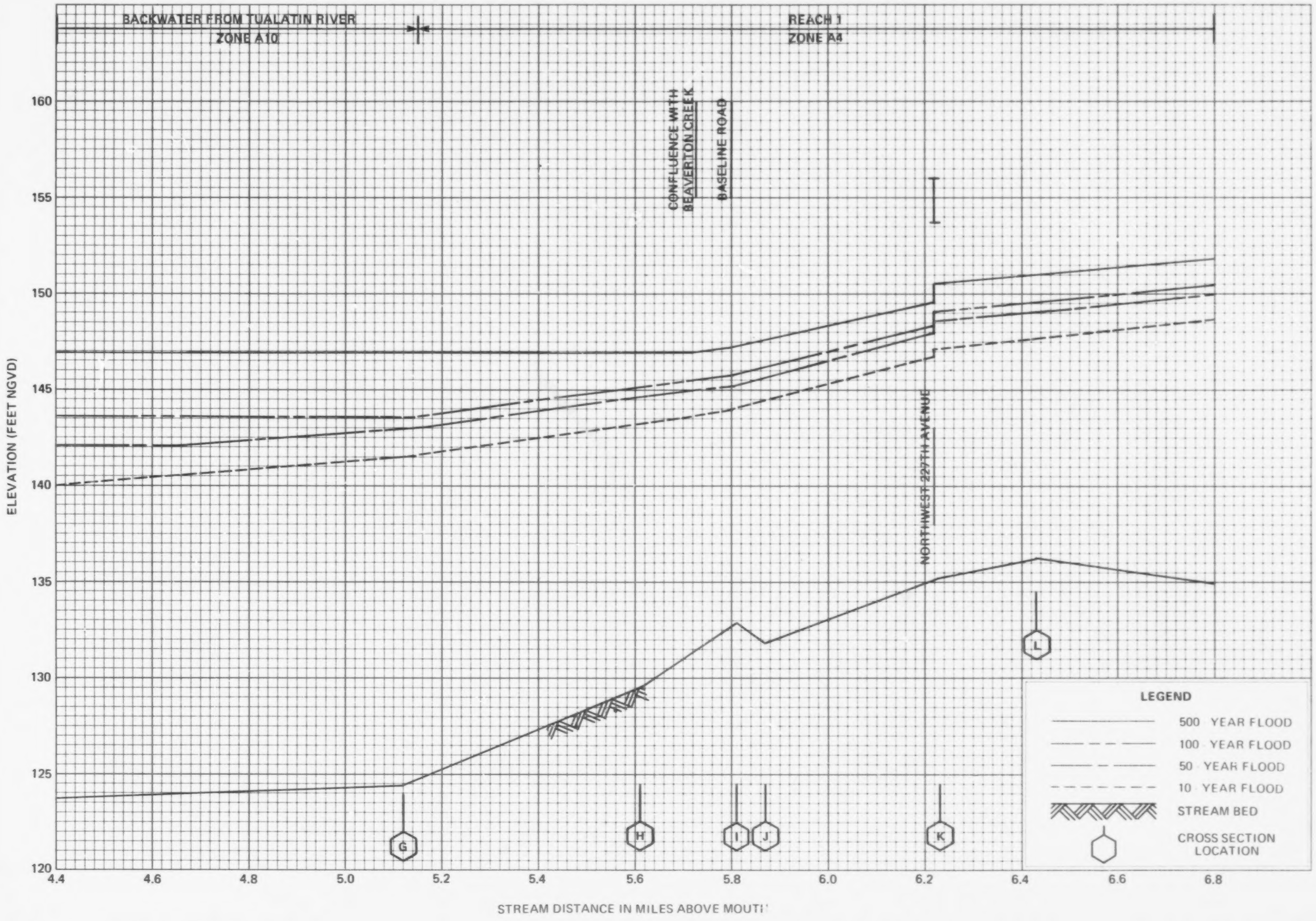

FLOOD PROFILES

ROCK CREEK (NEAR HILLSBORO)

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

37P

91

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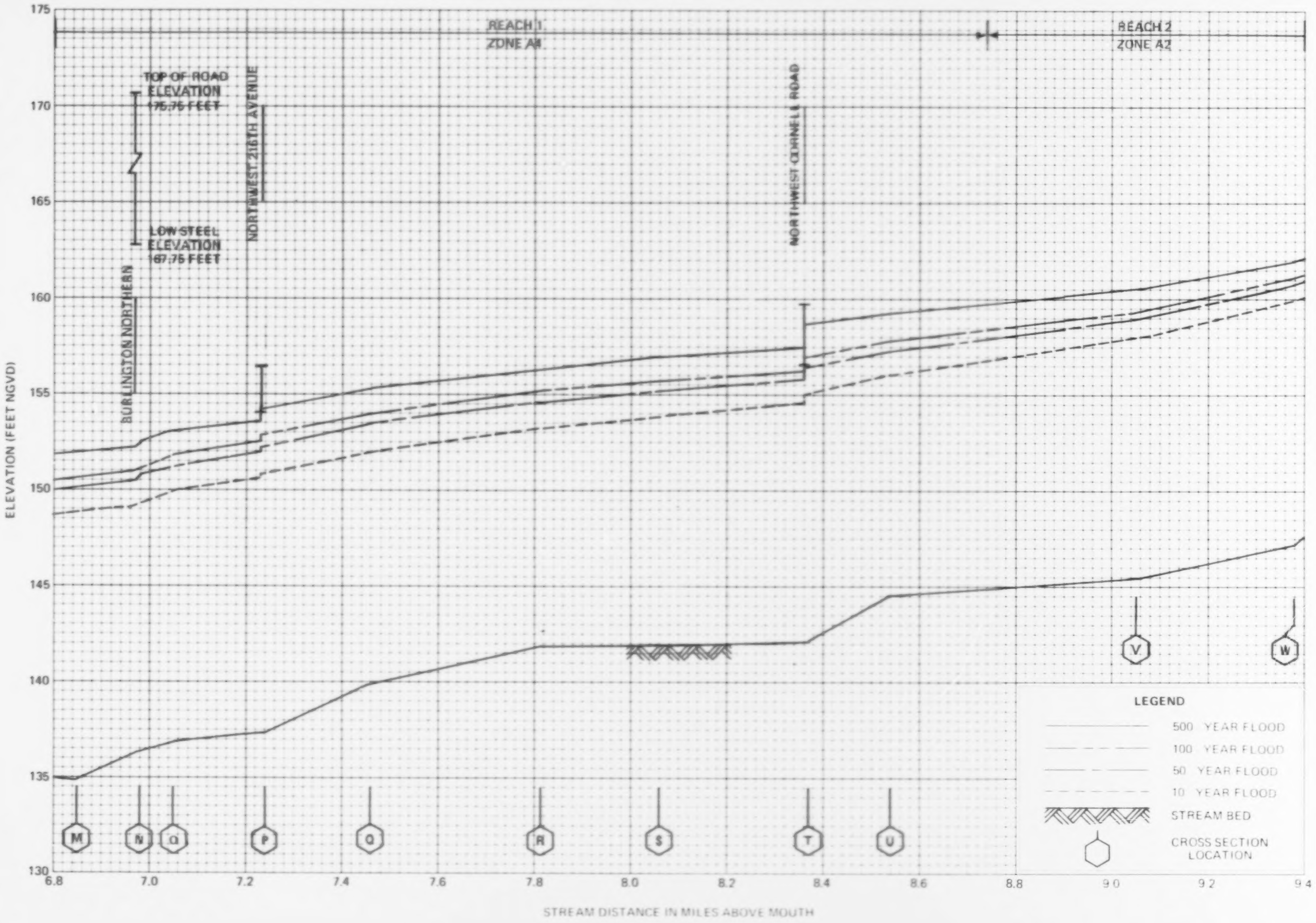
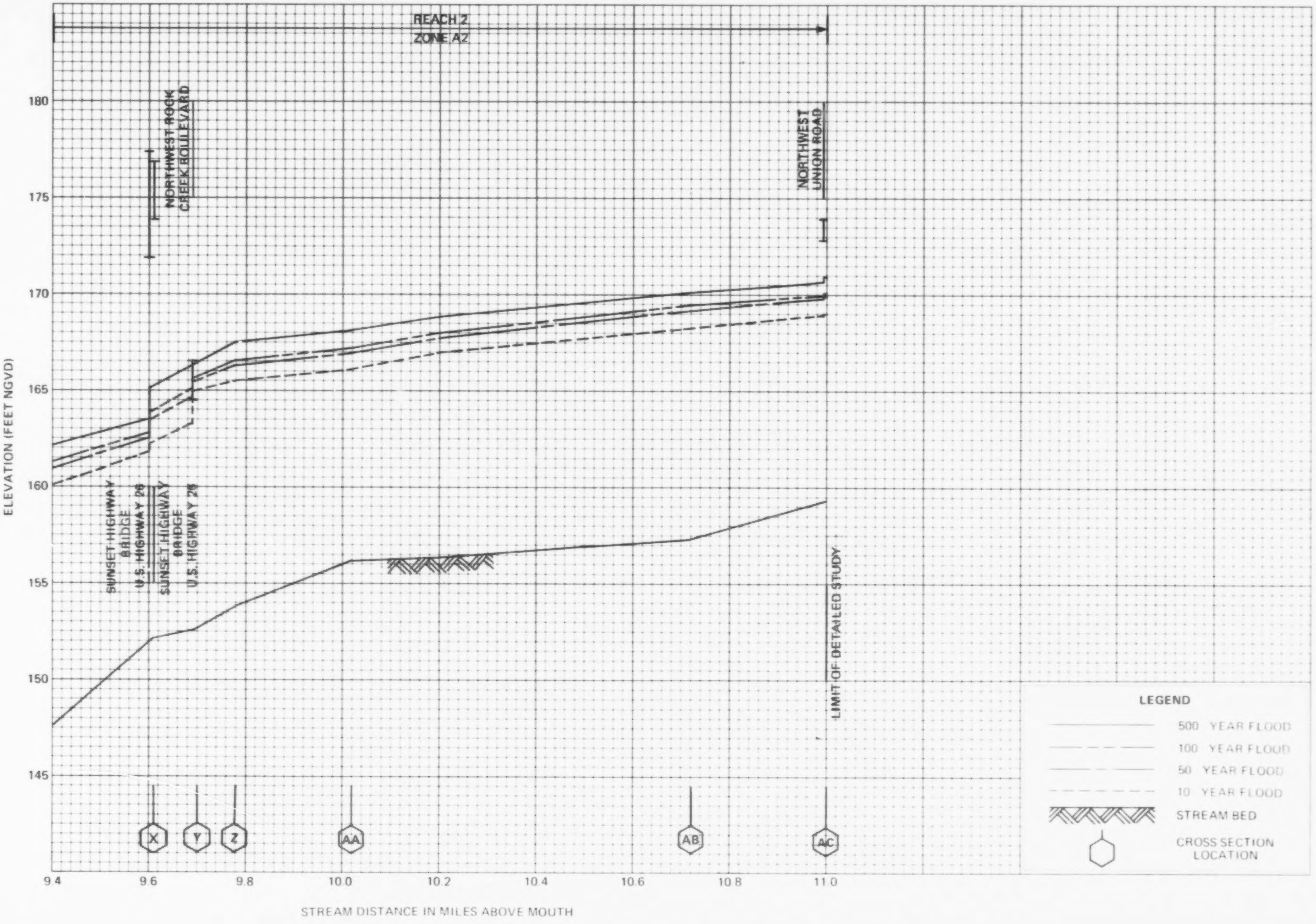


FLOOD PROFILES

ROCK CREEK (NEAR HILLSBORO)

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)



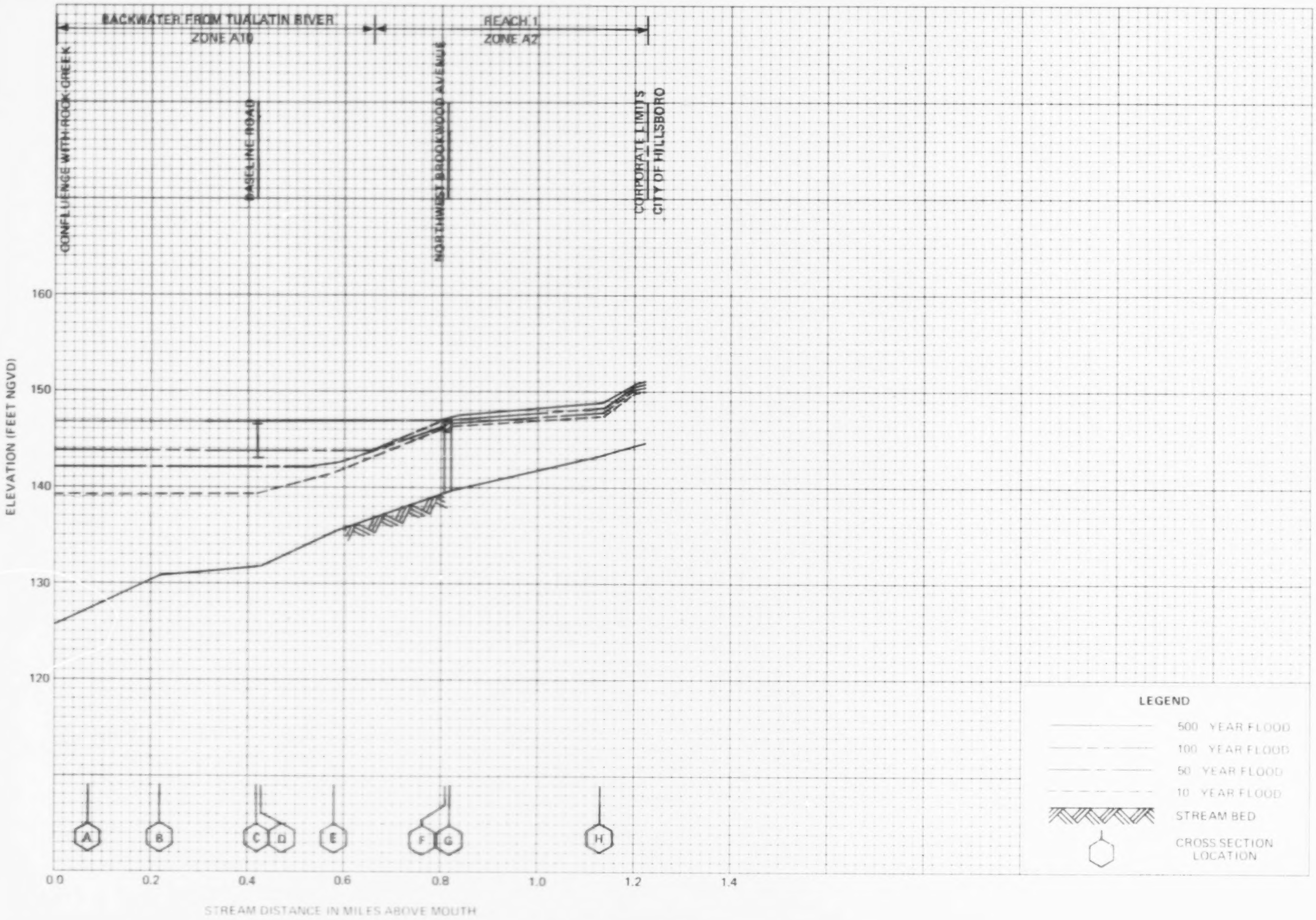
FLOOD PROFILES

ROCK CREEK (NEAR HILLSBORO)

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

39P



FLOOD PROFILES

DAWSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

40P

94

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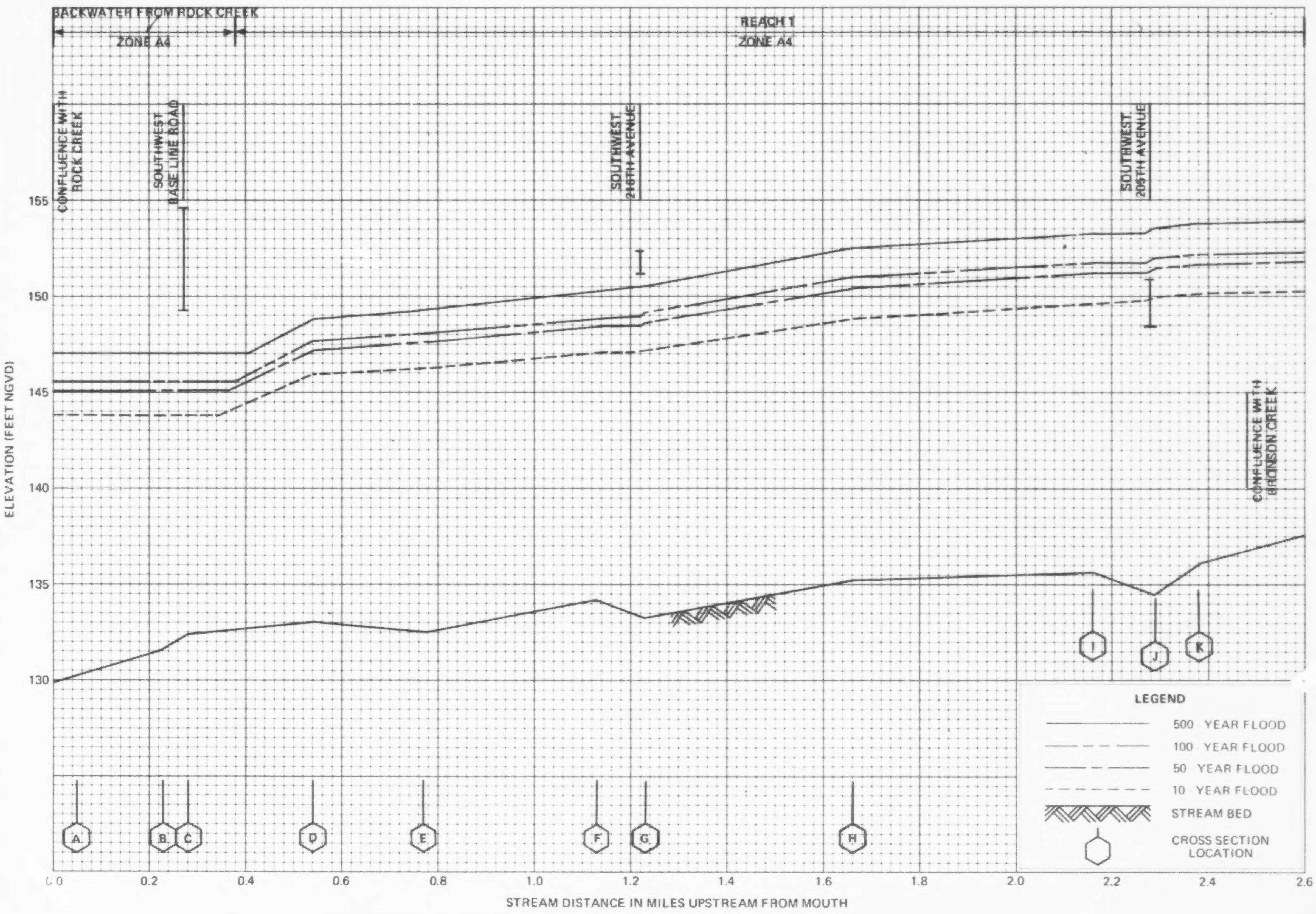

FLOOD PROFILES

BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

41P

95

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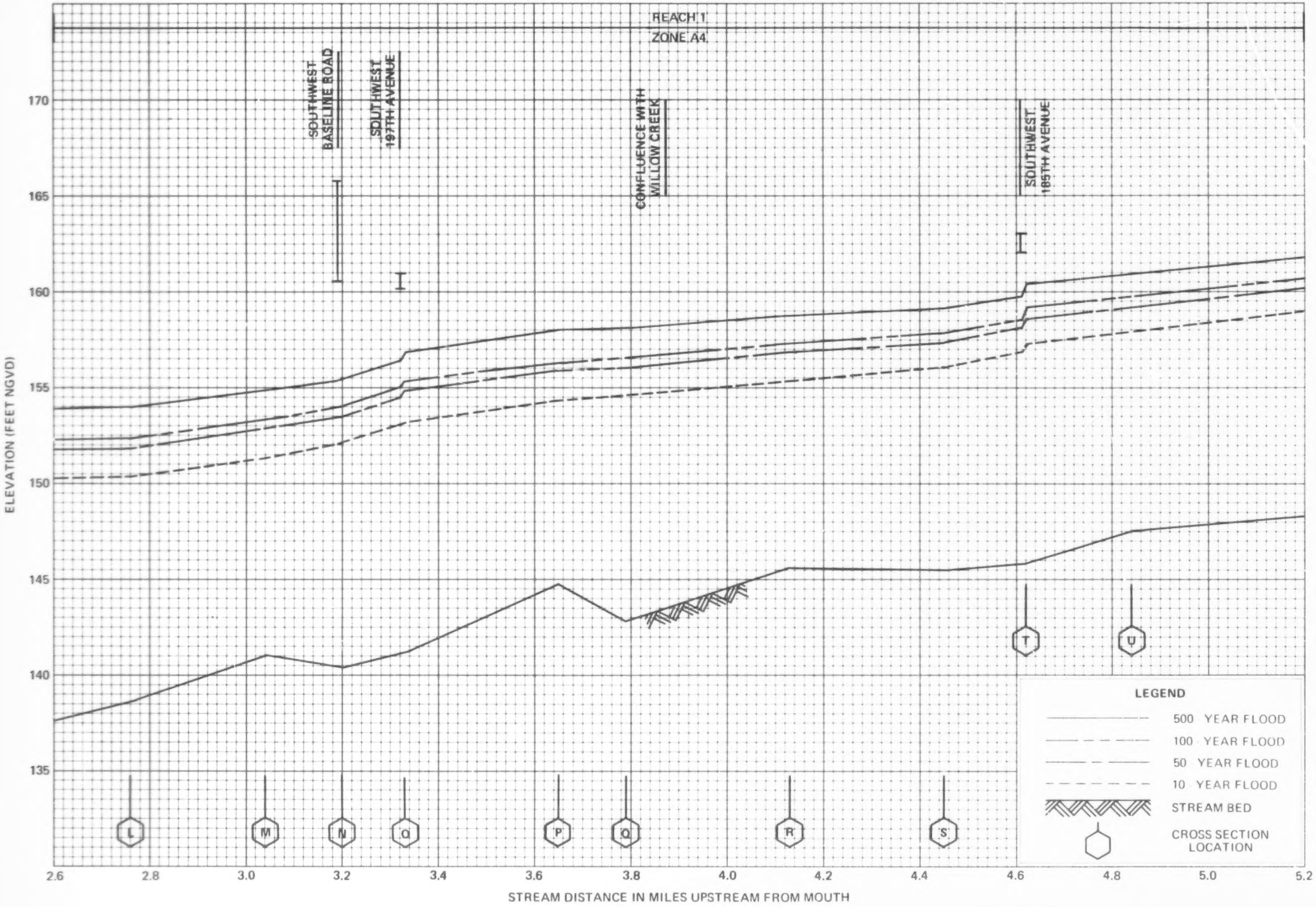


FLOOD PROFILES

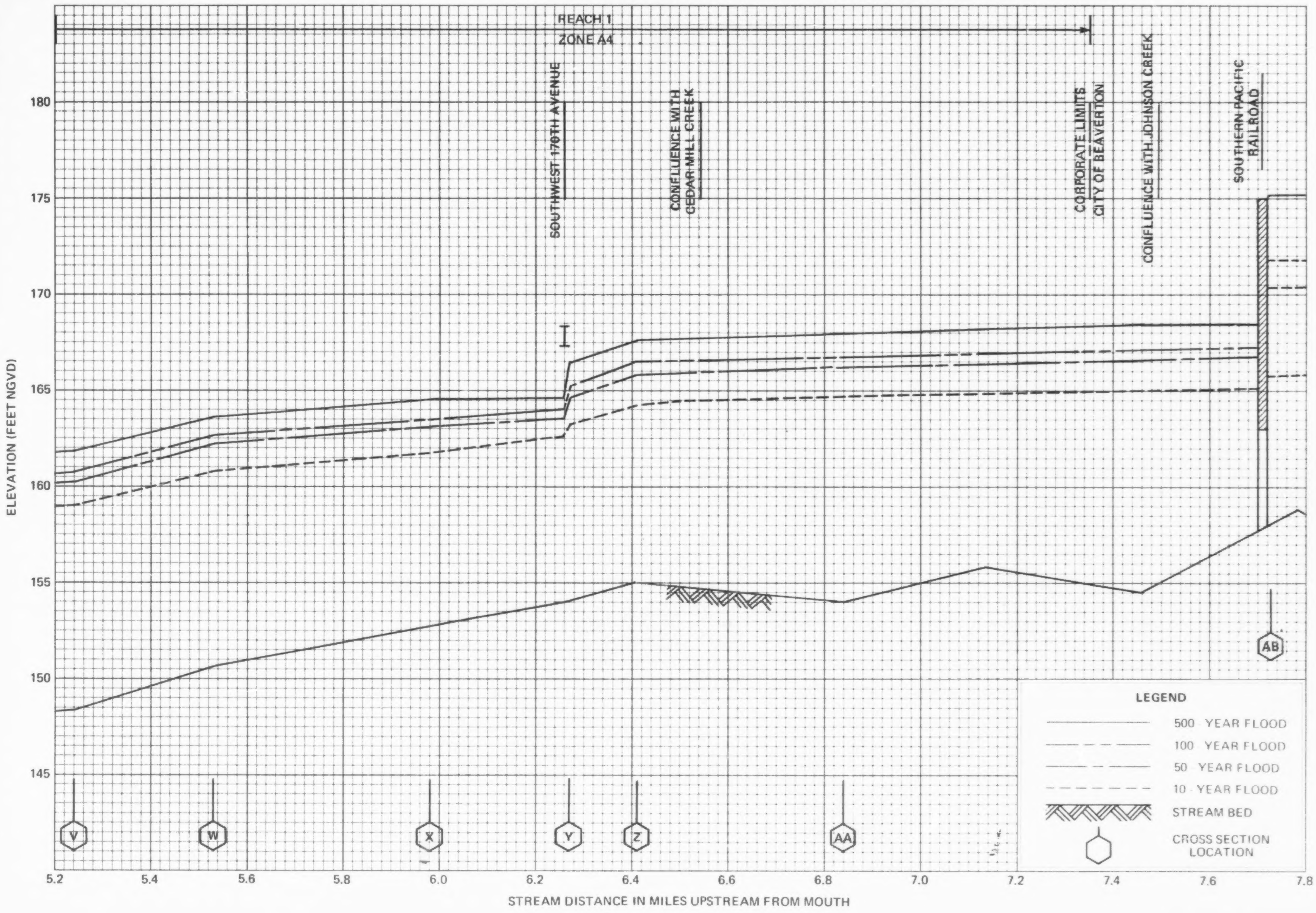
BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

42P

96



FLOOD PROFILES

BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

43P

97

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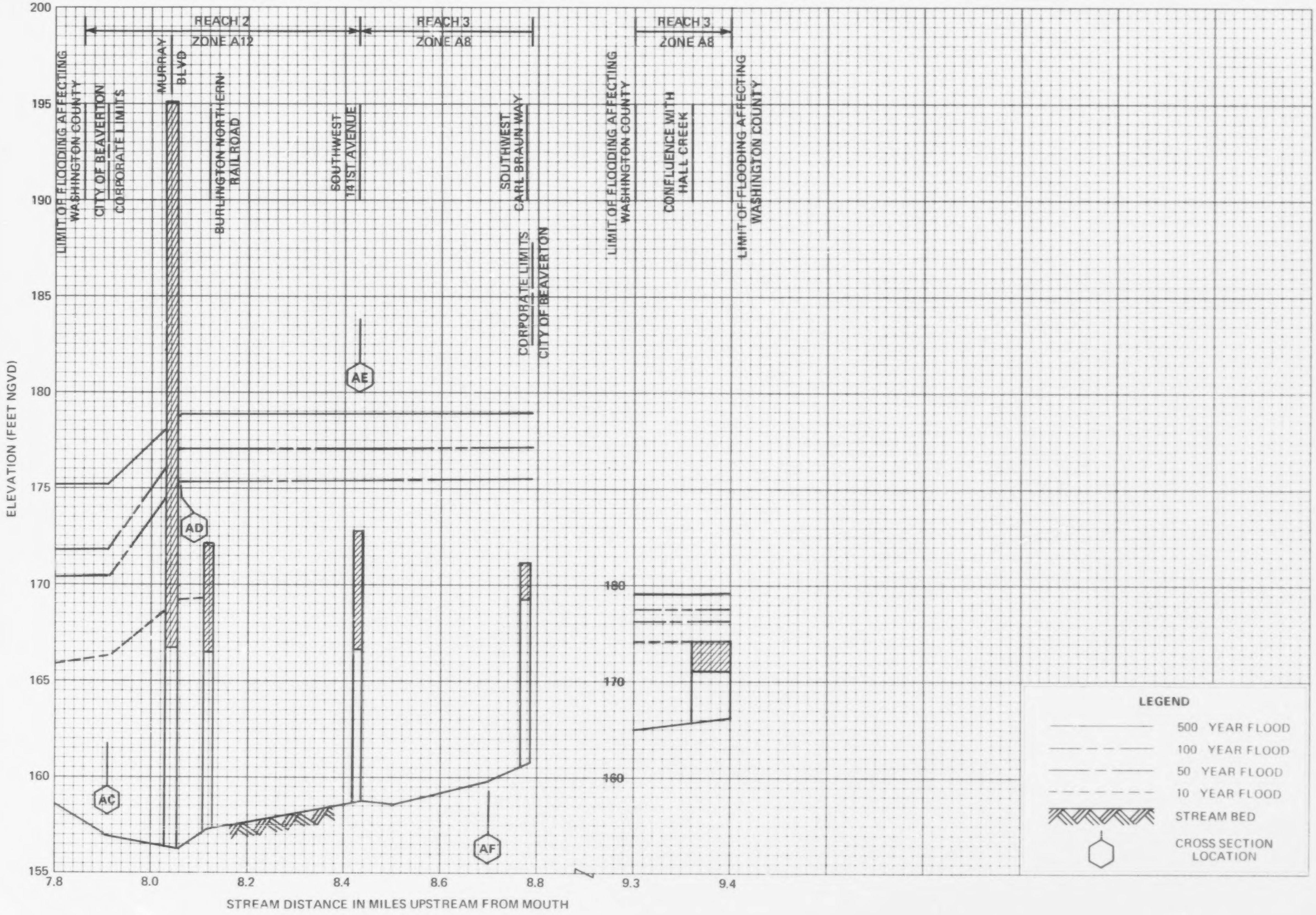

FLOOD PROFILES

BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

44P

98

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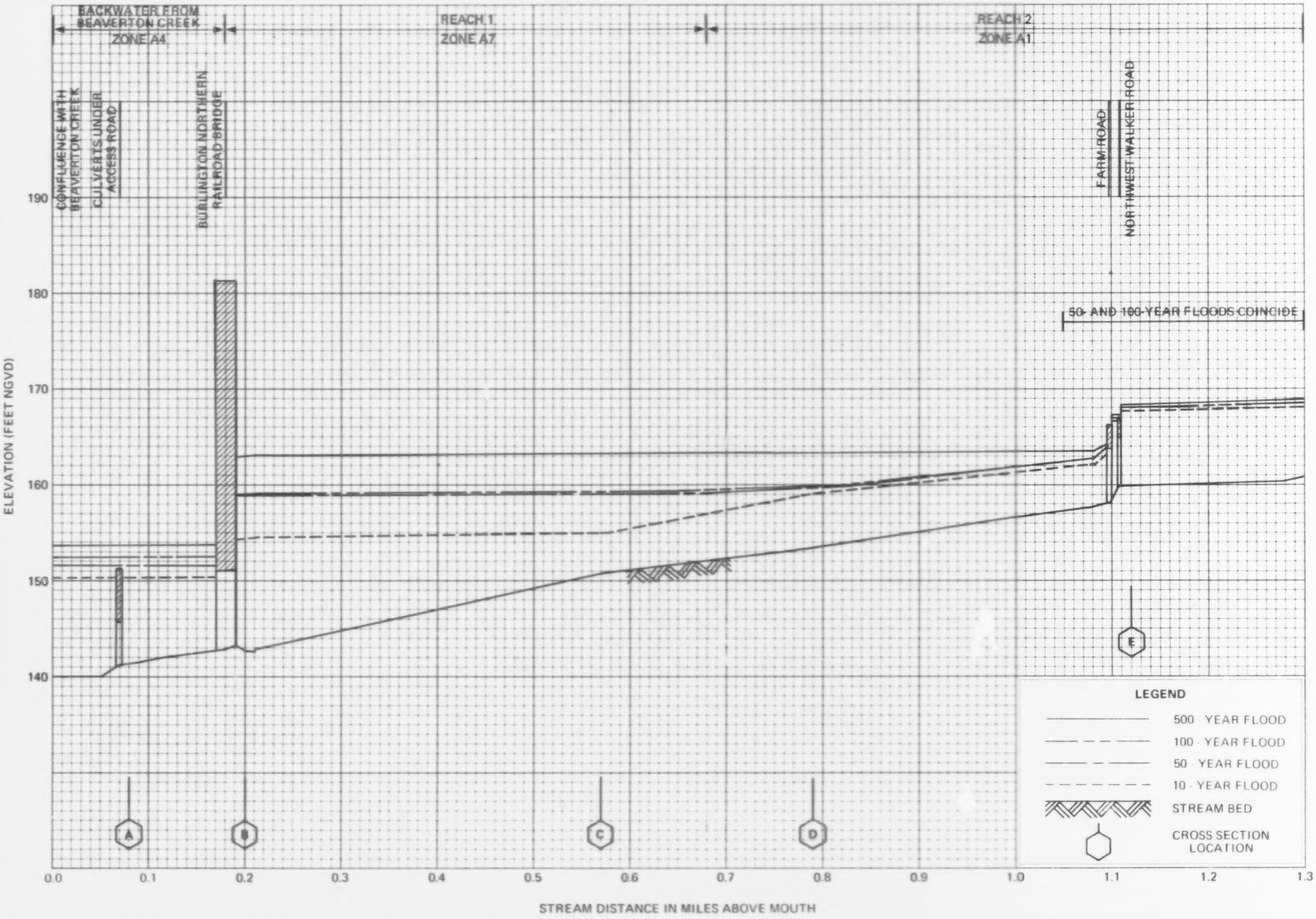

FLOOD PROFILES

BRONSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

45P

99

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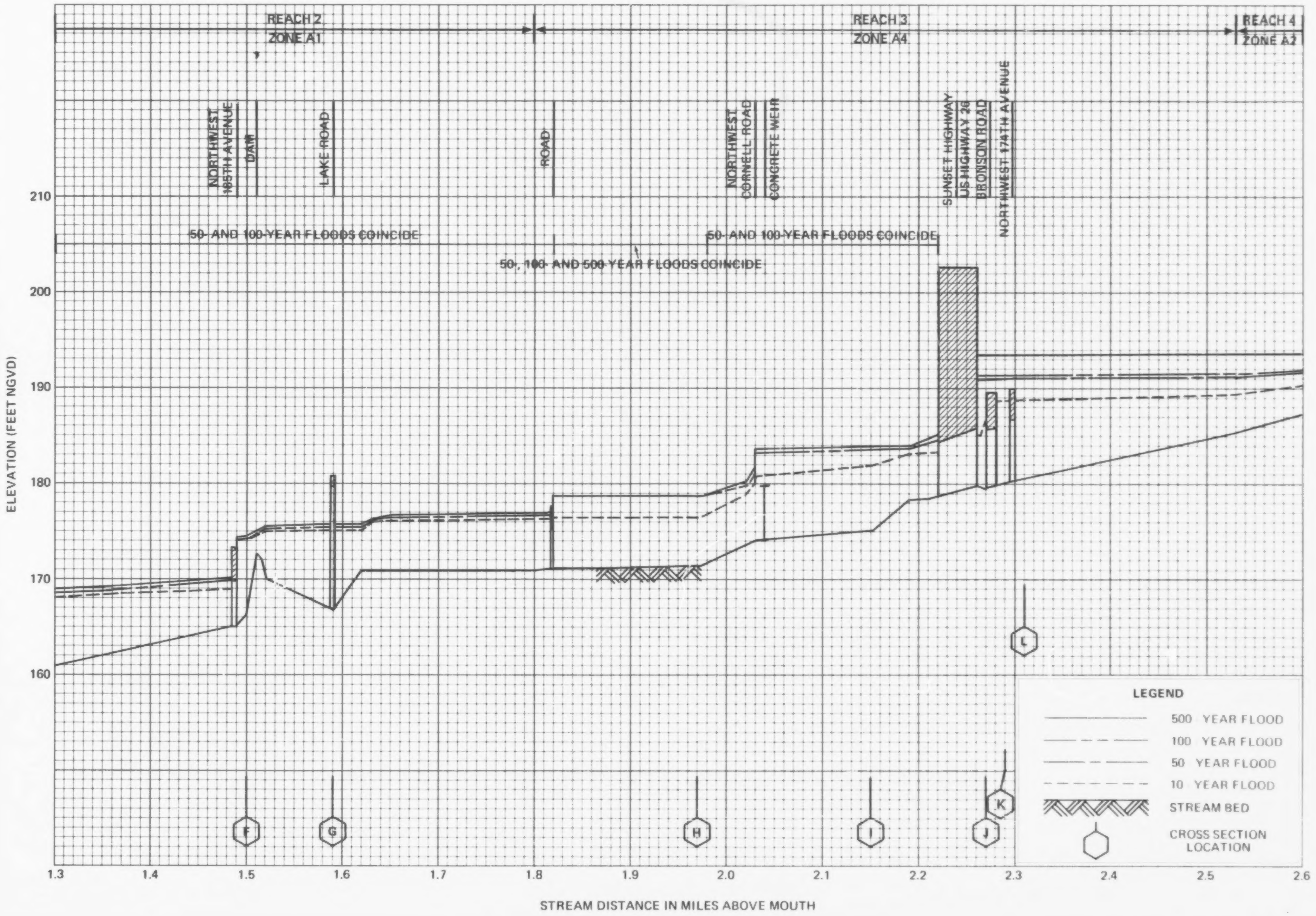
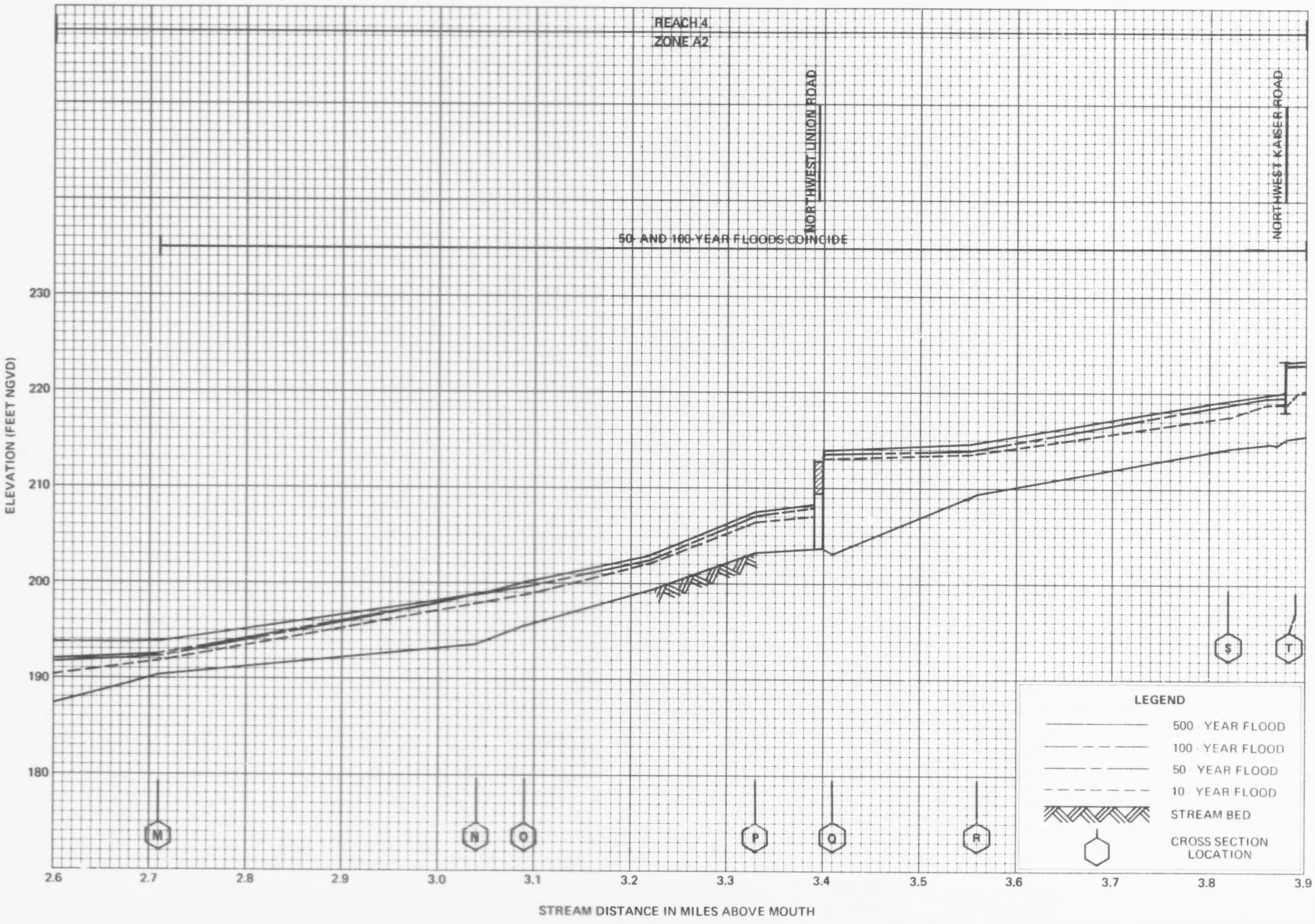


FLOOD PROFILES

BRONSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)



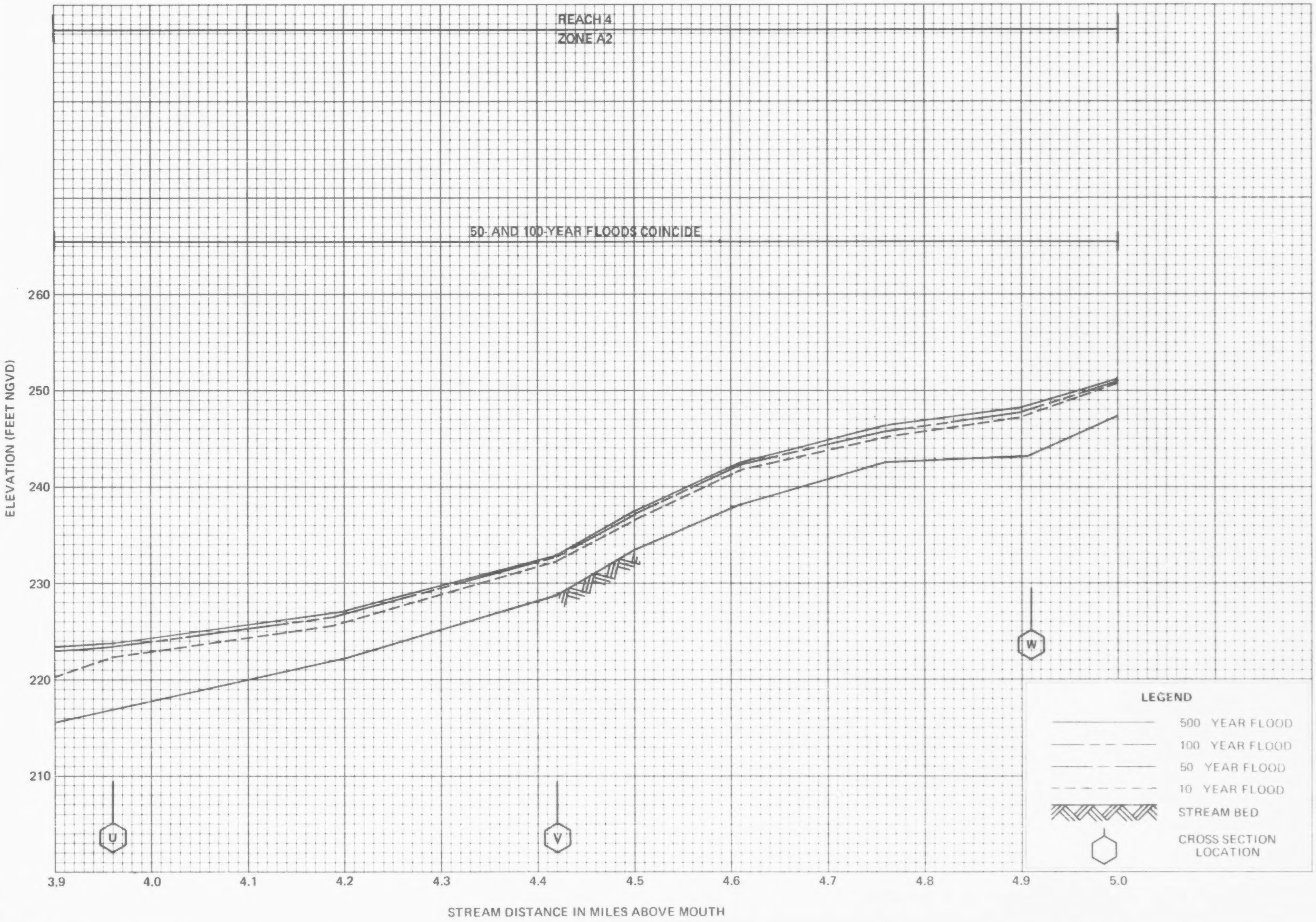
FLOOD PROFILES

BRONSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

47P



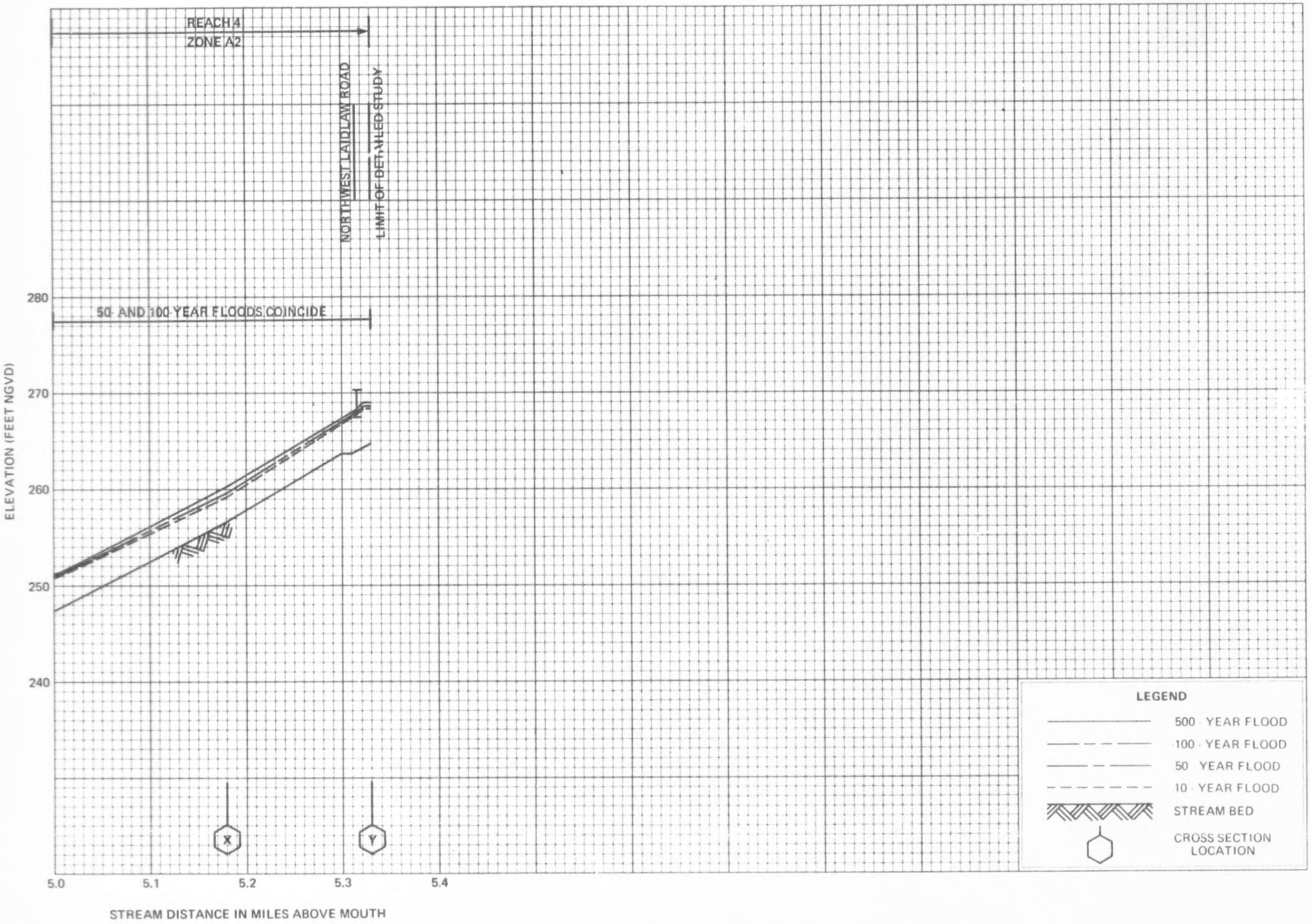
FLOOD PROFILES

BRONSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

48P



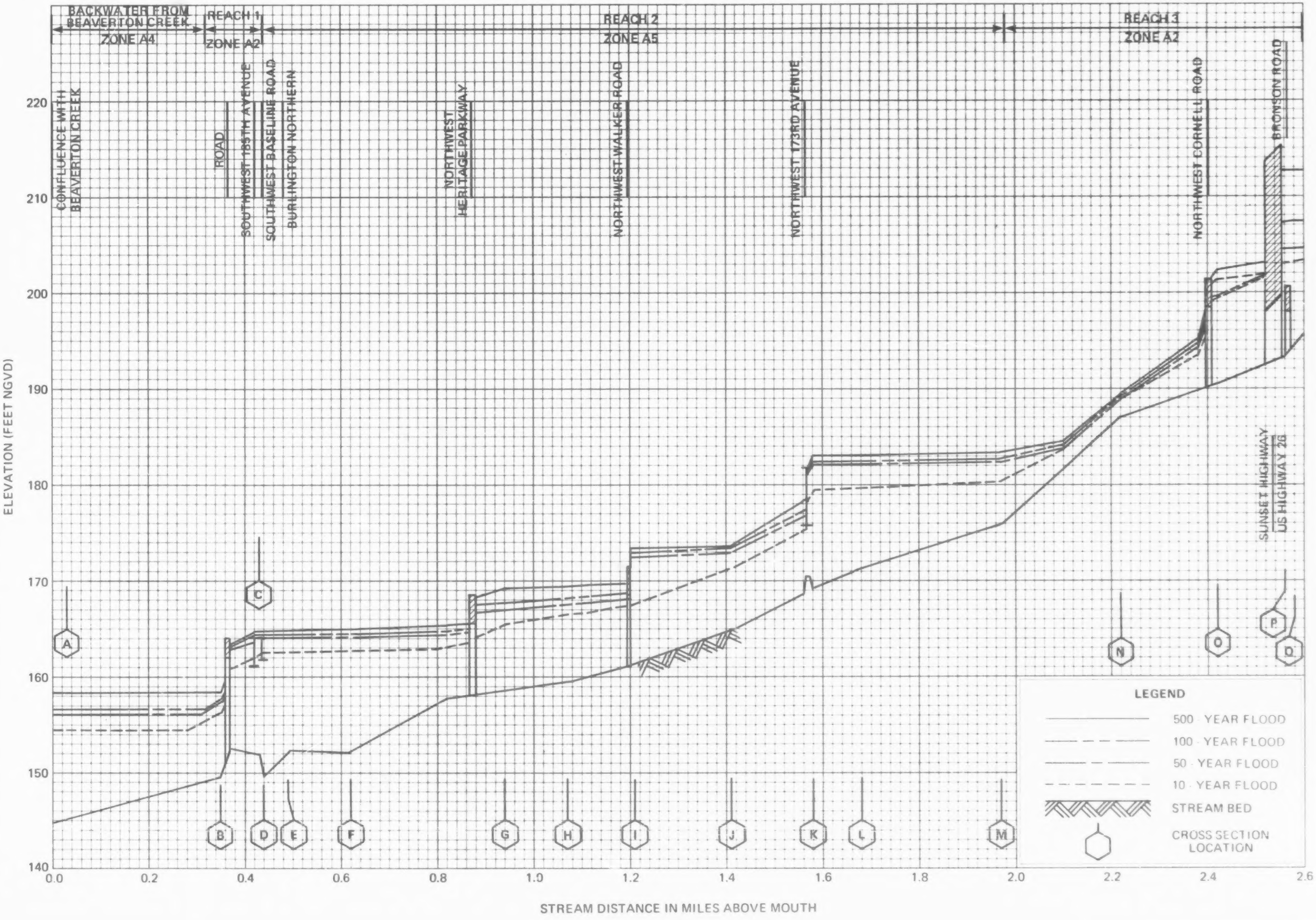
FLOOD PROFILES

BRONSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

49P



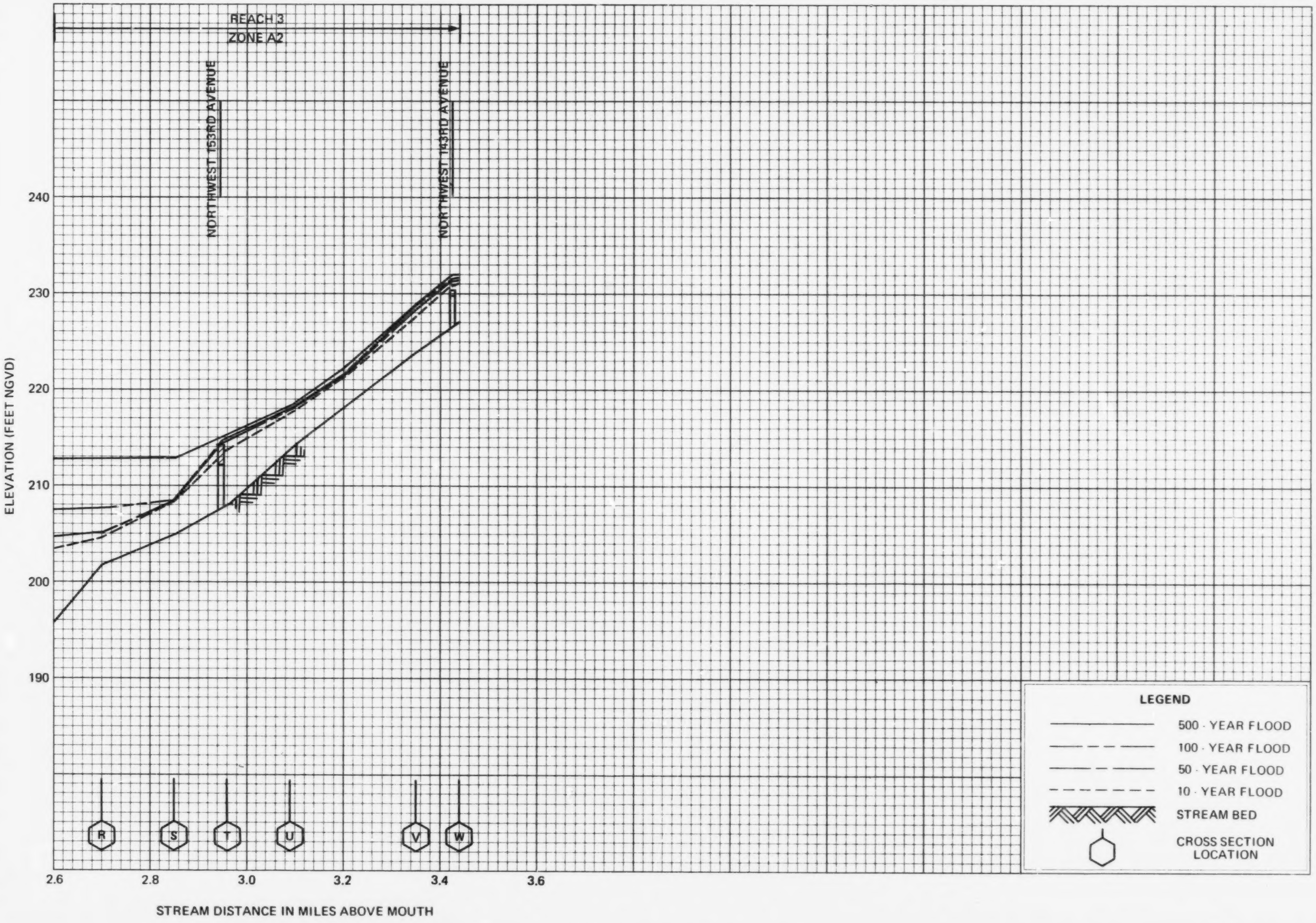
FLOOD PROFILES

WILLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

50P

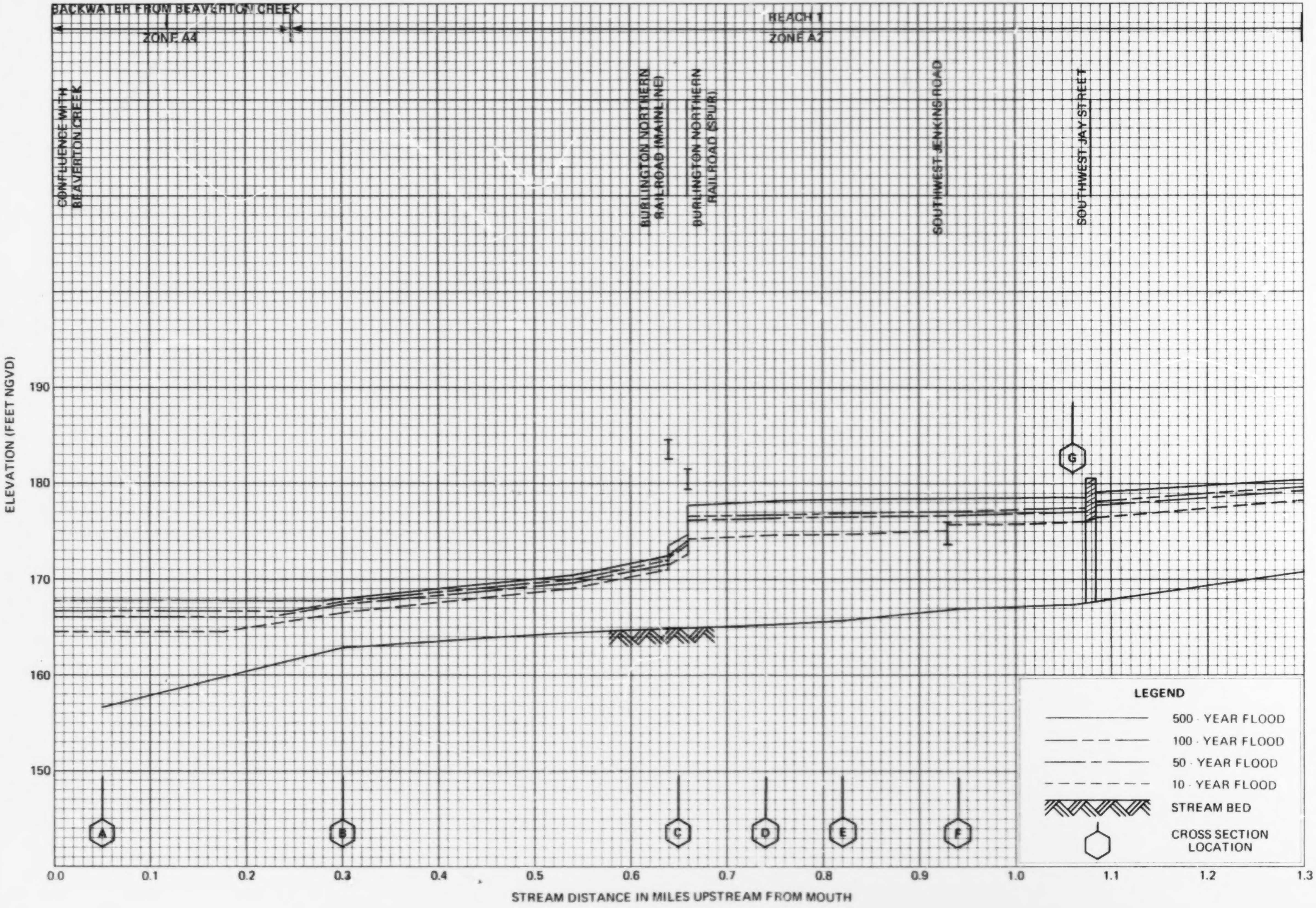


FLOOD PROFILES

WILLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)



FLOOD PROFILES

CEDAR MILL CREEK

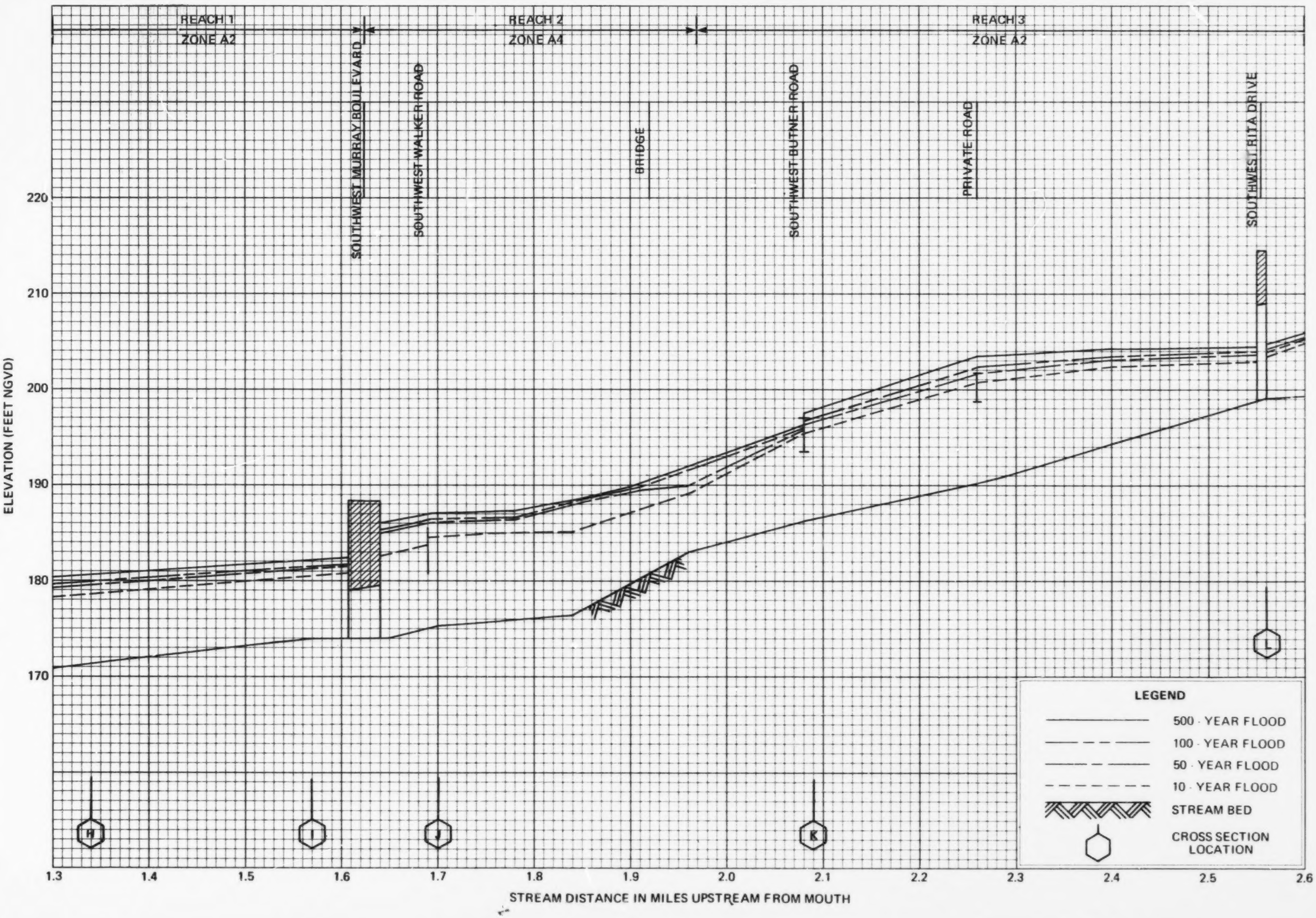
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

52P

106

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

CEDAR MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

53P

107

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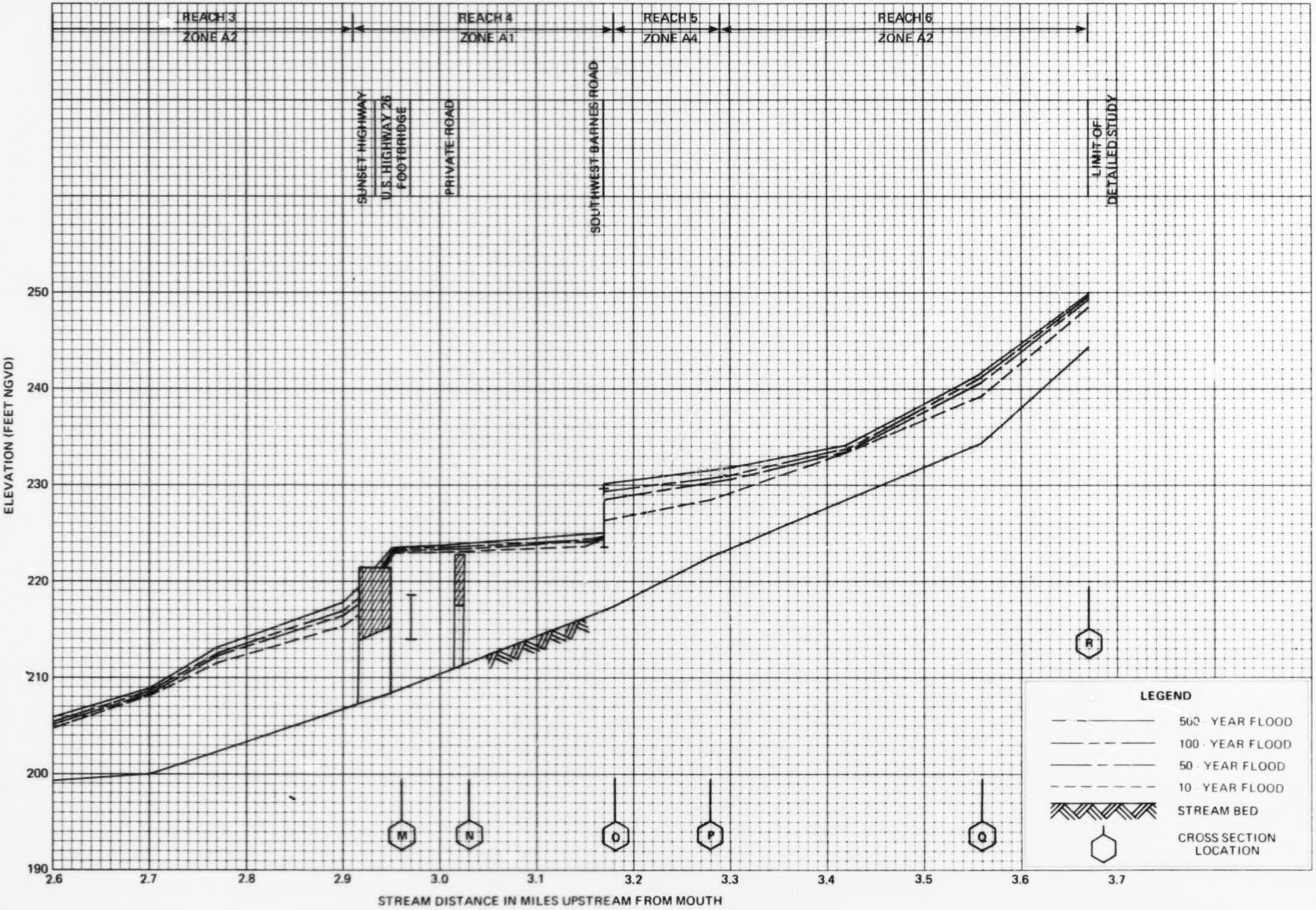

FLOOD PROFILES

CEDAR MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

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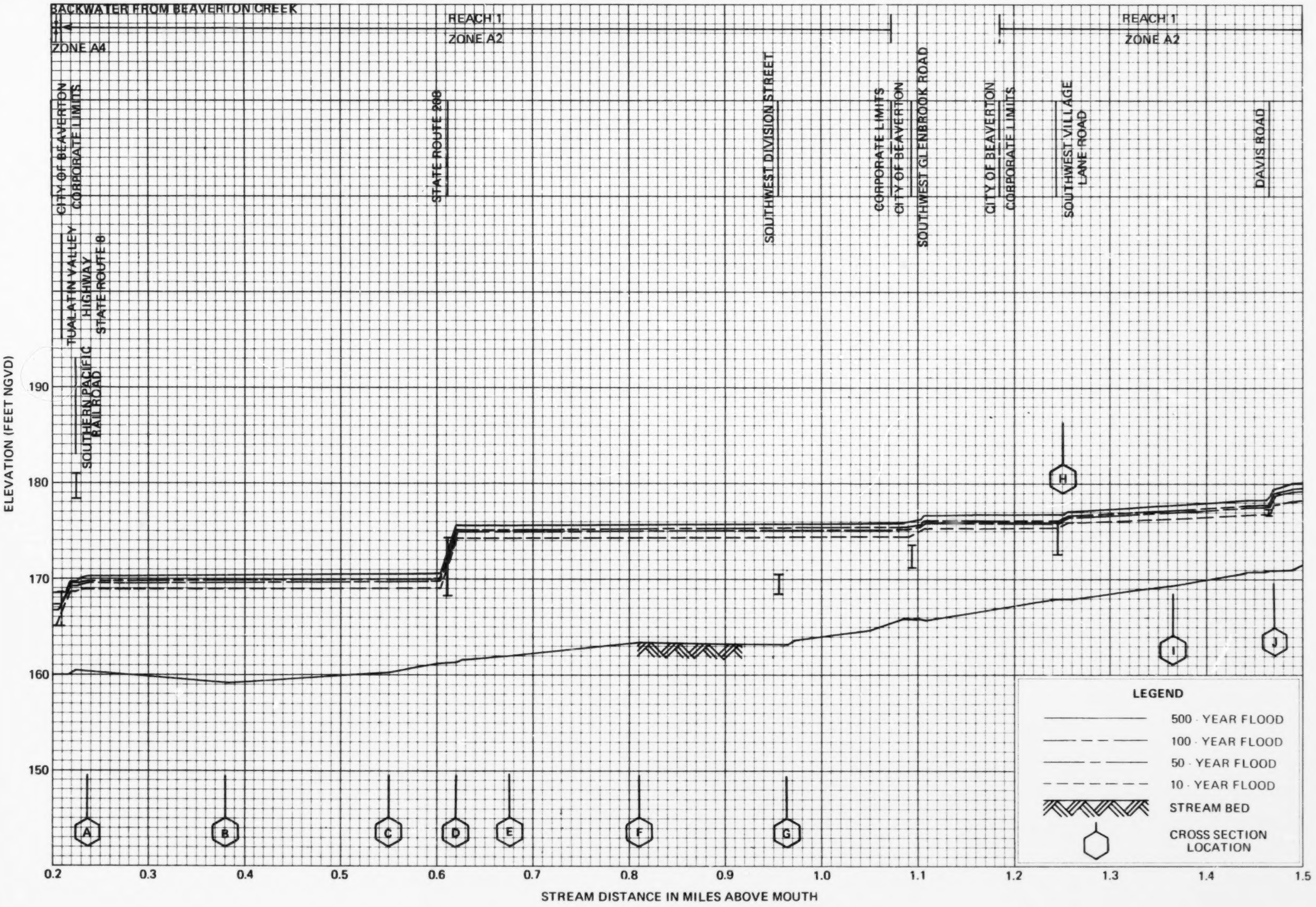


FLOOD PROFILES

JOHNSON CREEK

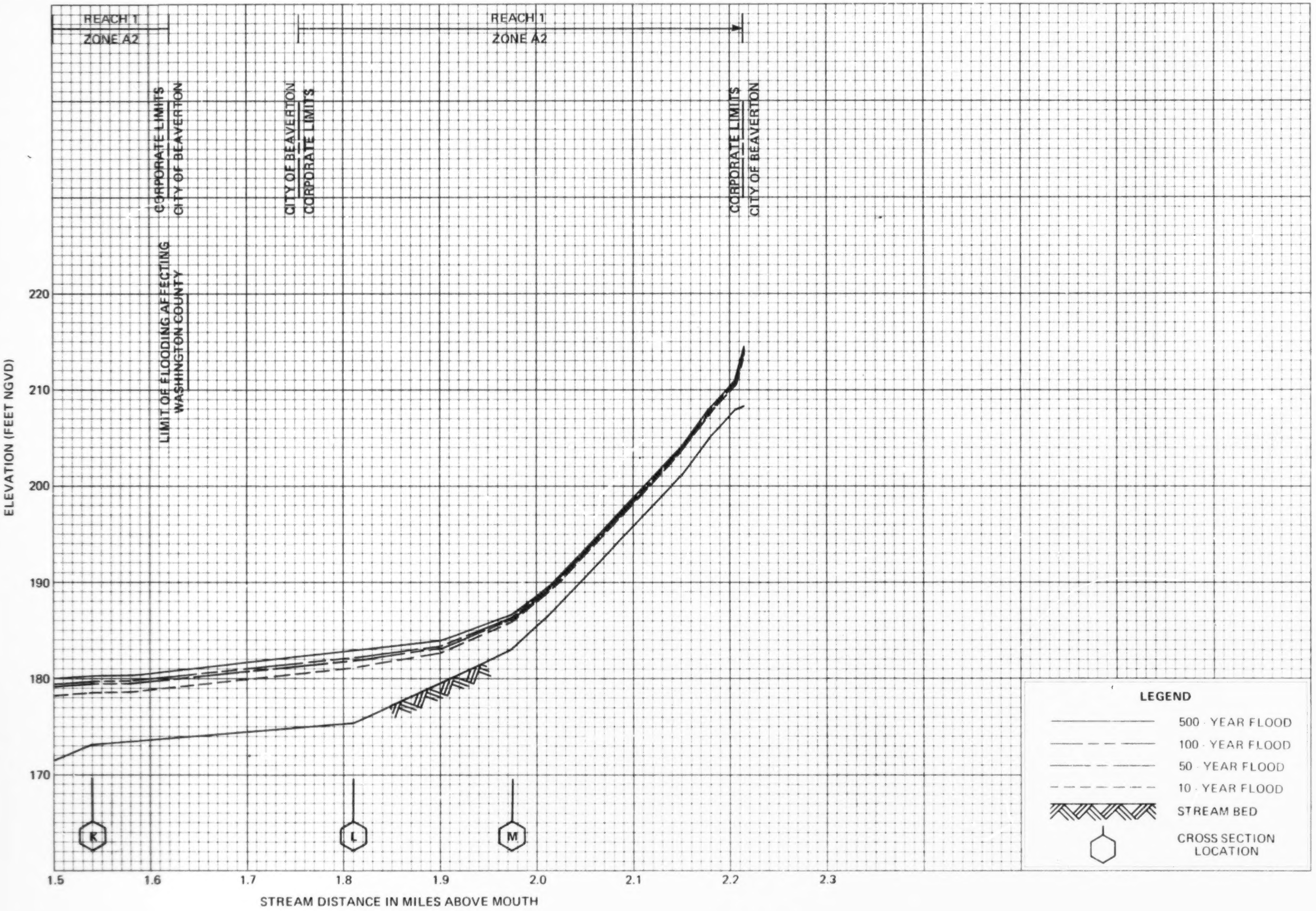
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

55P

109

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

56P

110

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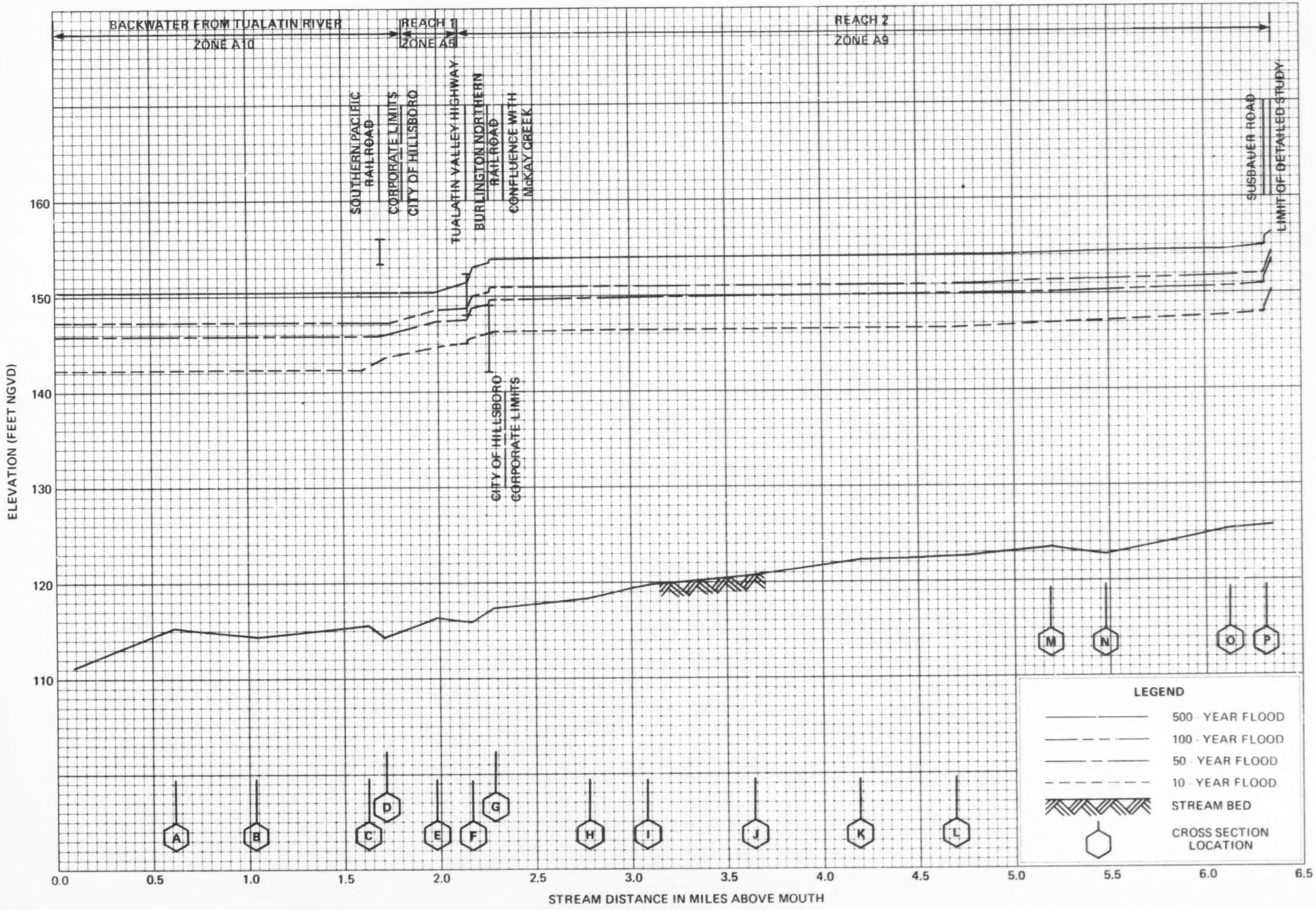

FLOOD PROFILES

DAIRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

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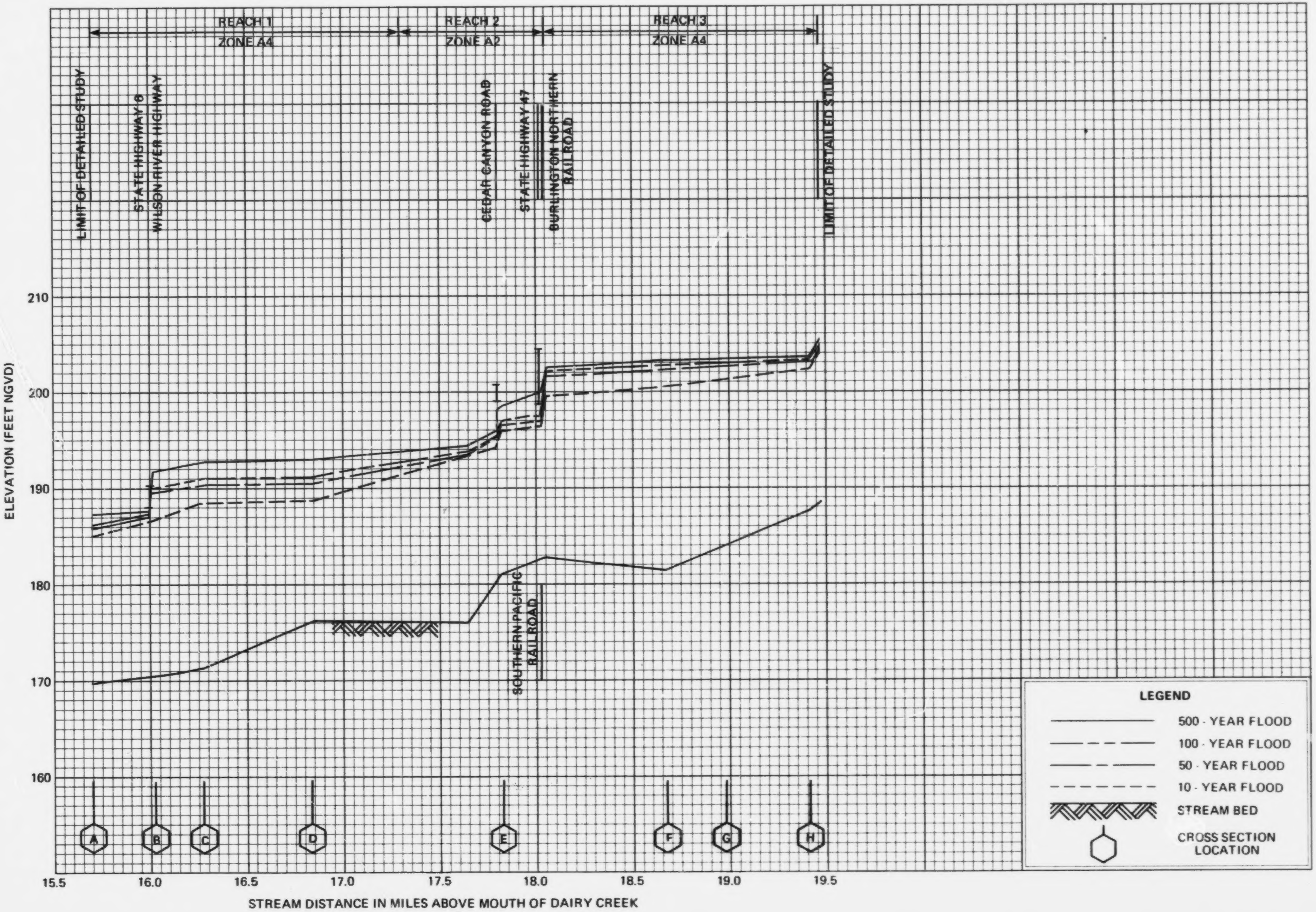
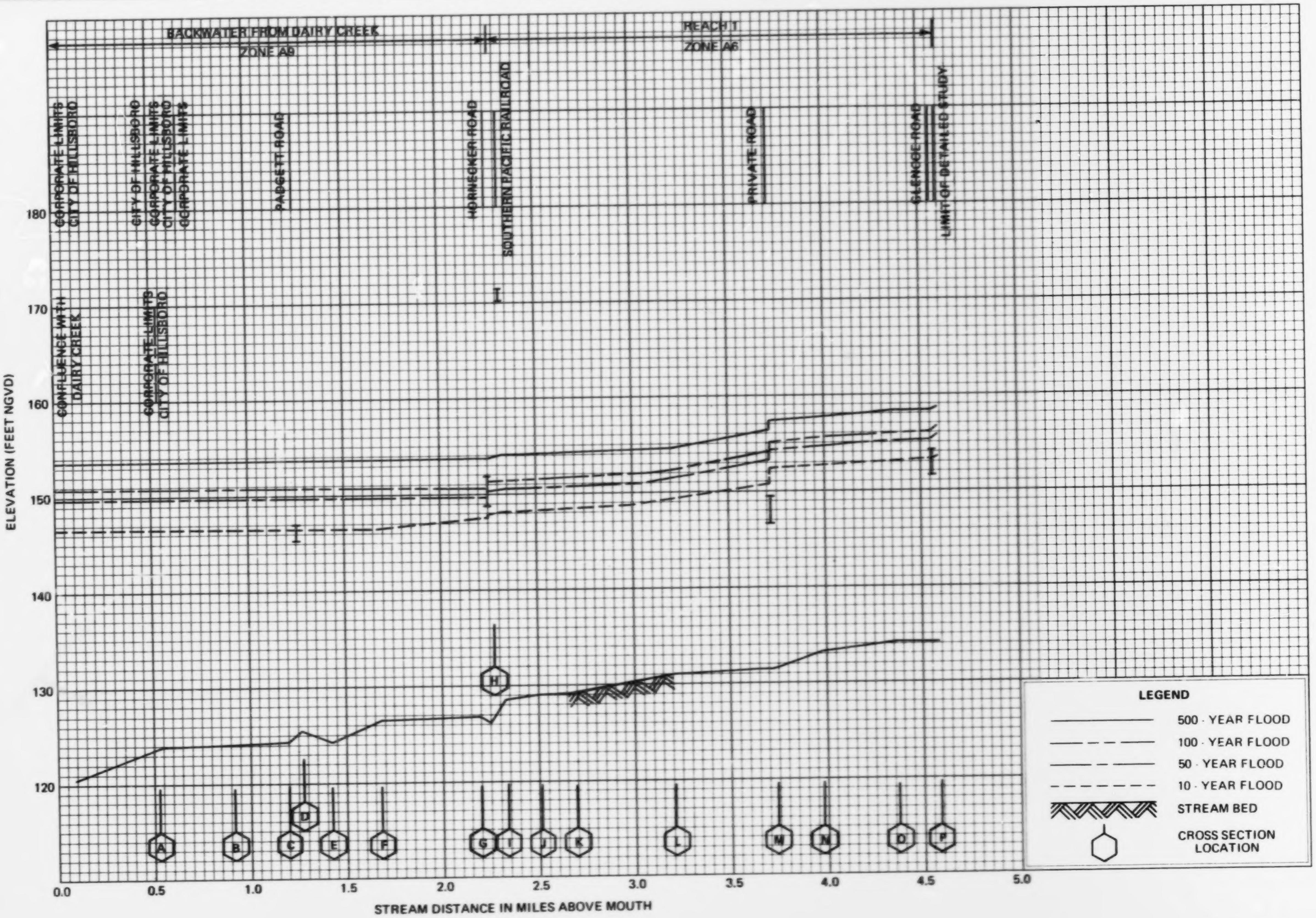


FLOOD PROFILES

WEST FORK DAIRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)



FLOOD PROFILES

McKAY CREEK

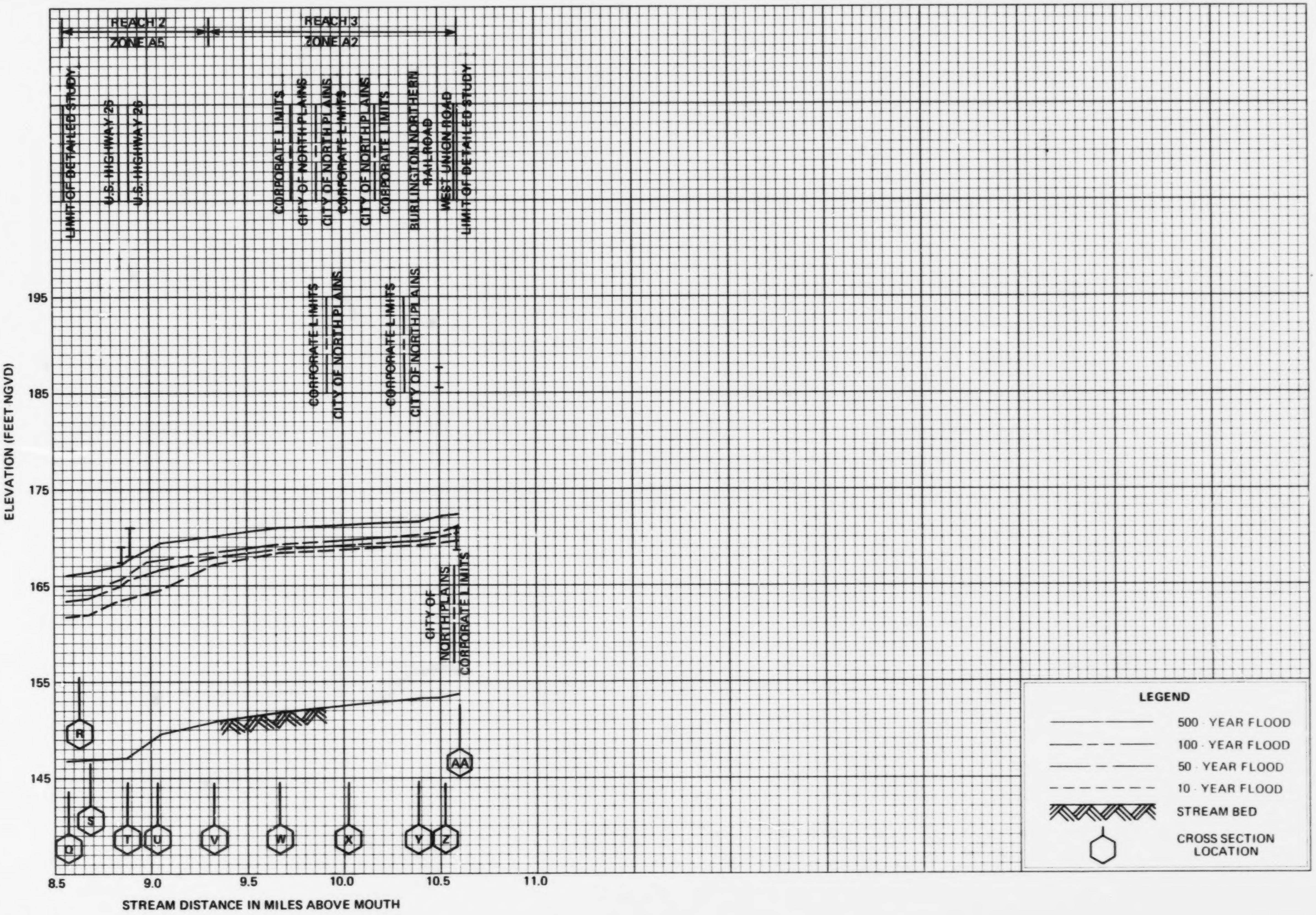
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

59P

113

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

McKAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

60P

114

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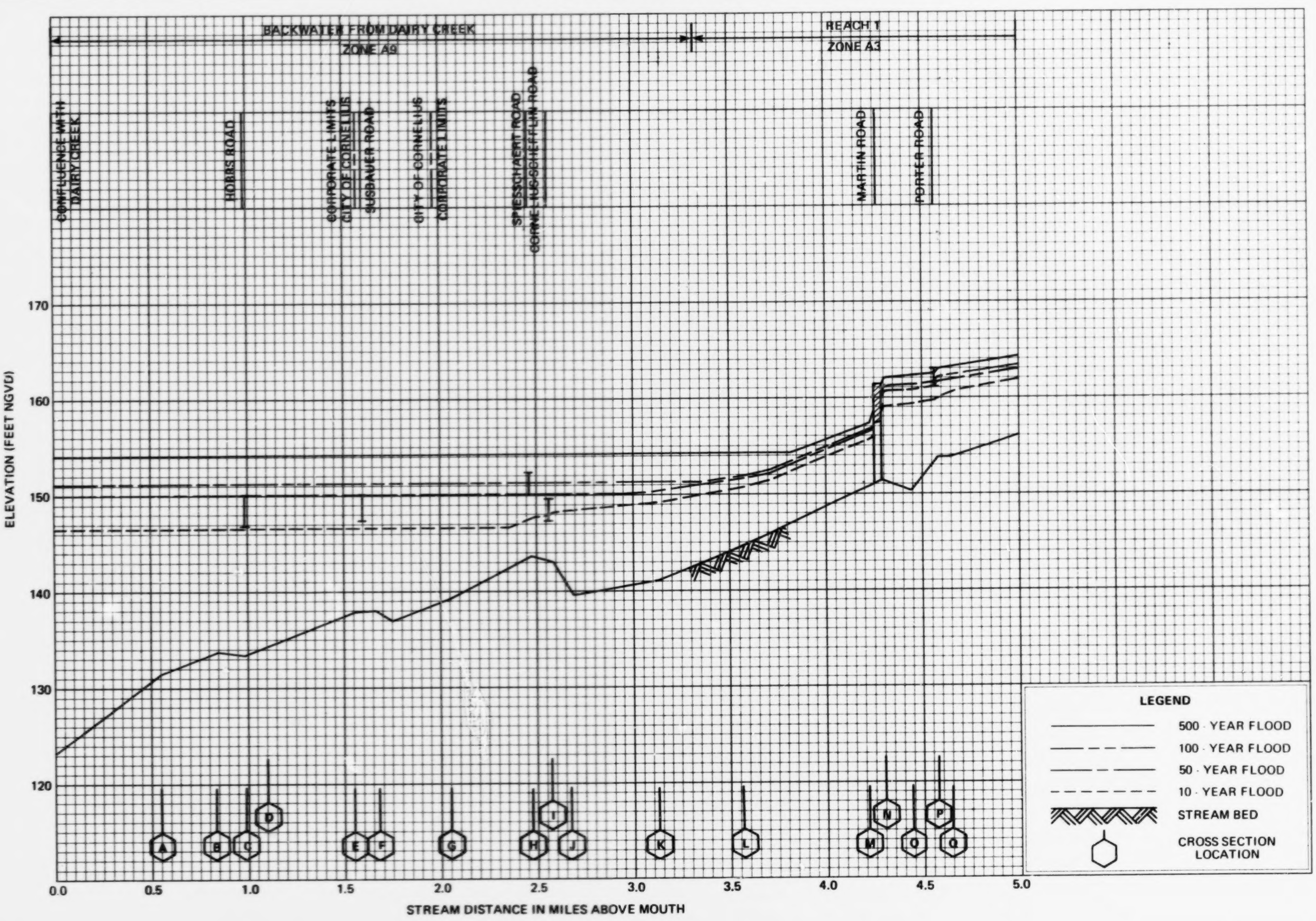


FLOOD PROFILES

COUNCIL CREEK

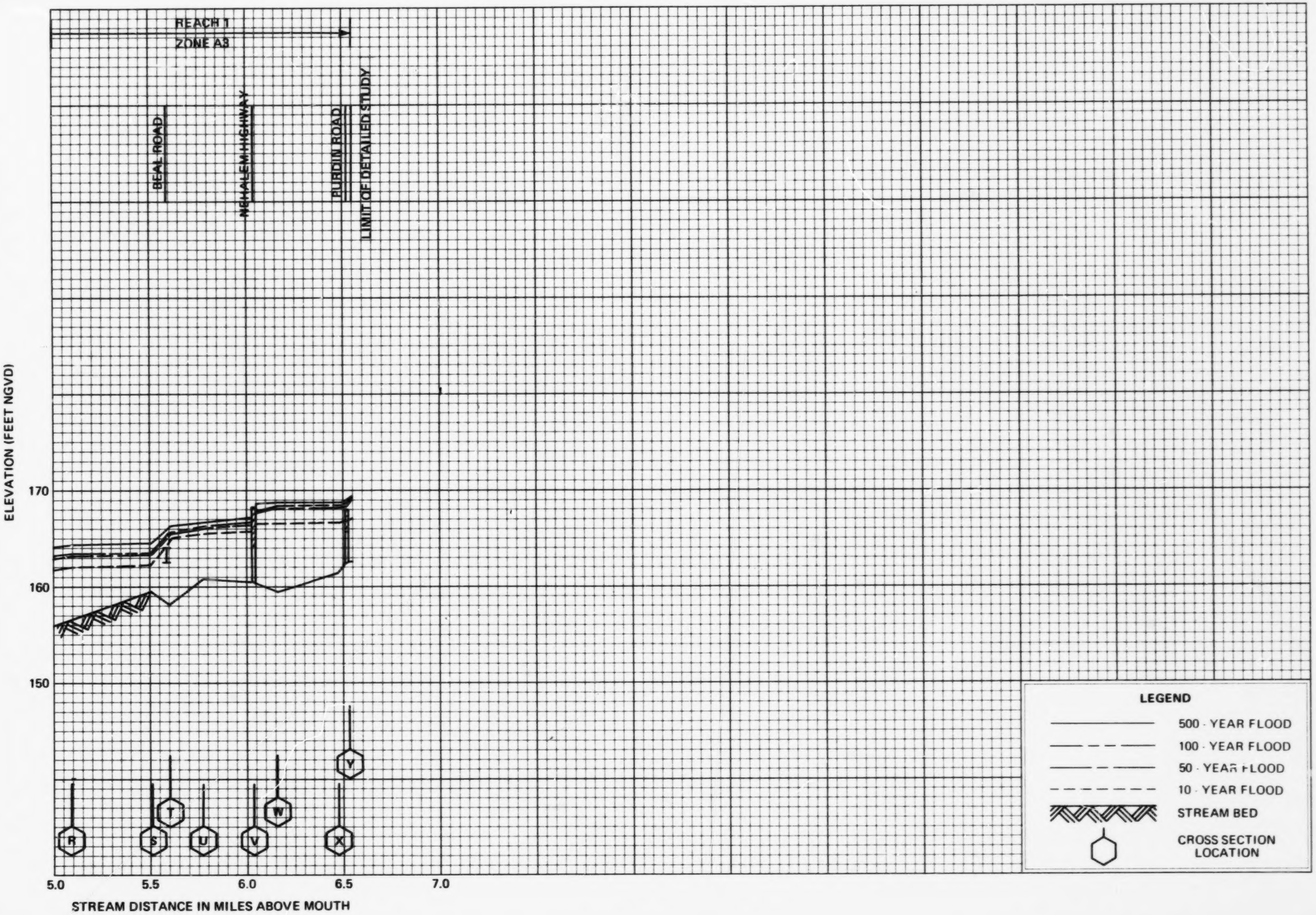
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

61P

115

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

COUNCIL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

116

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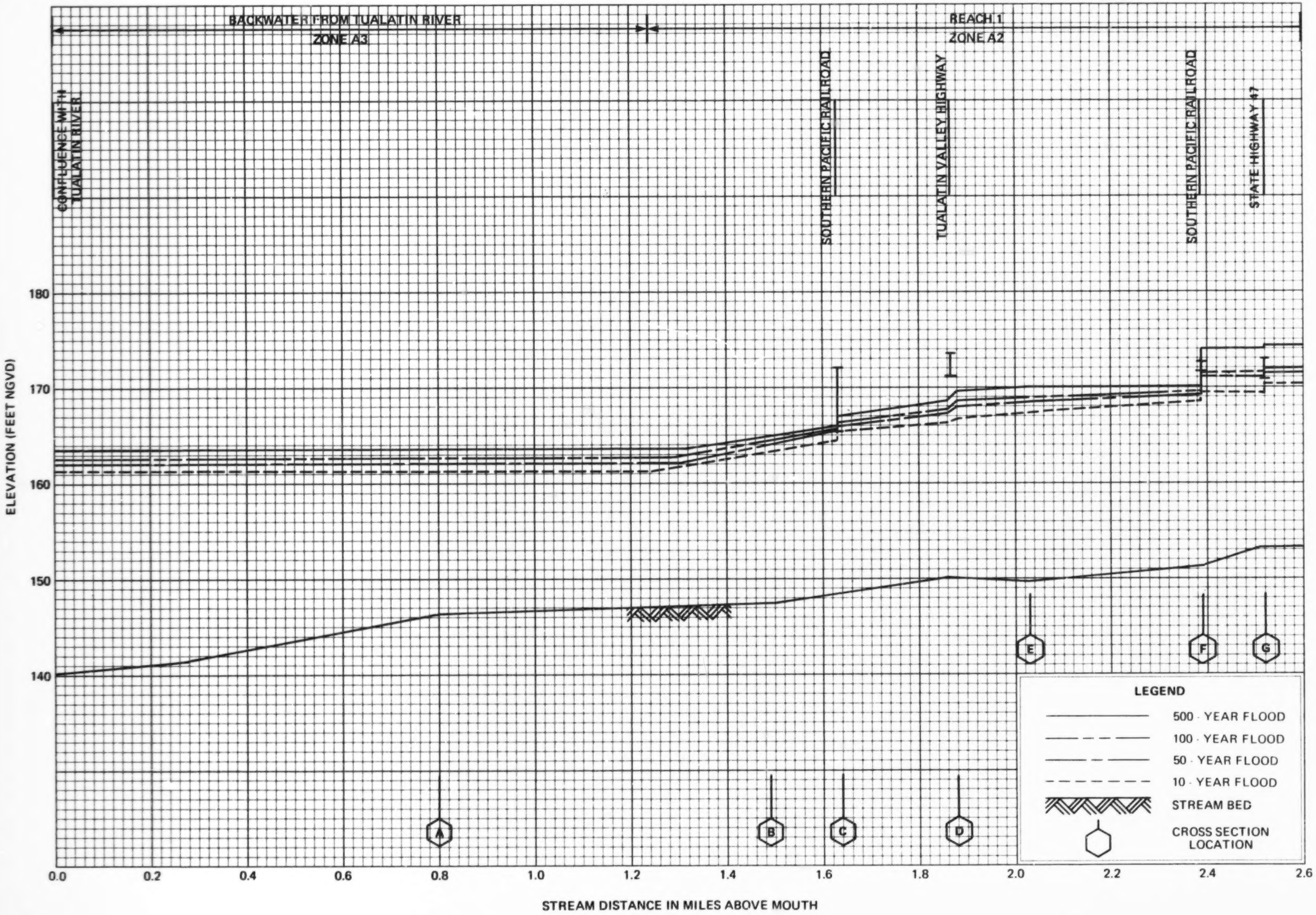


FLOOD PROFILES

GALES CREEK

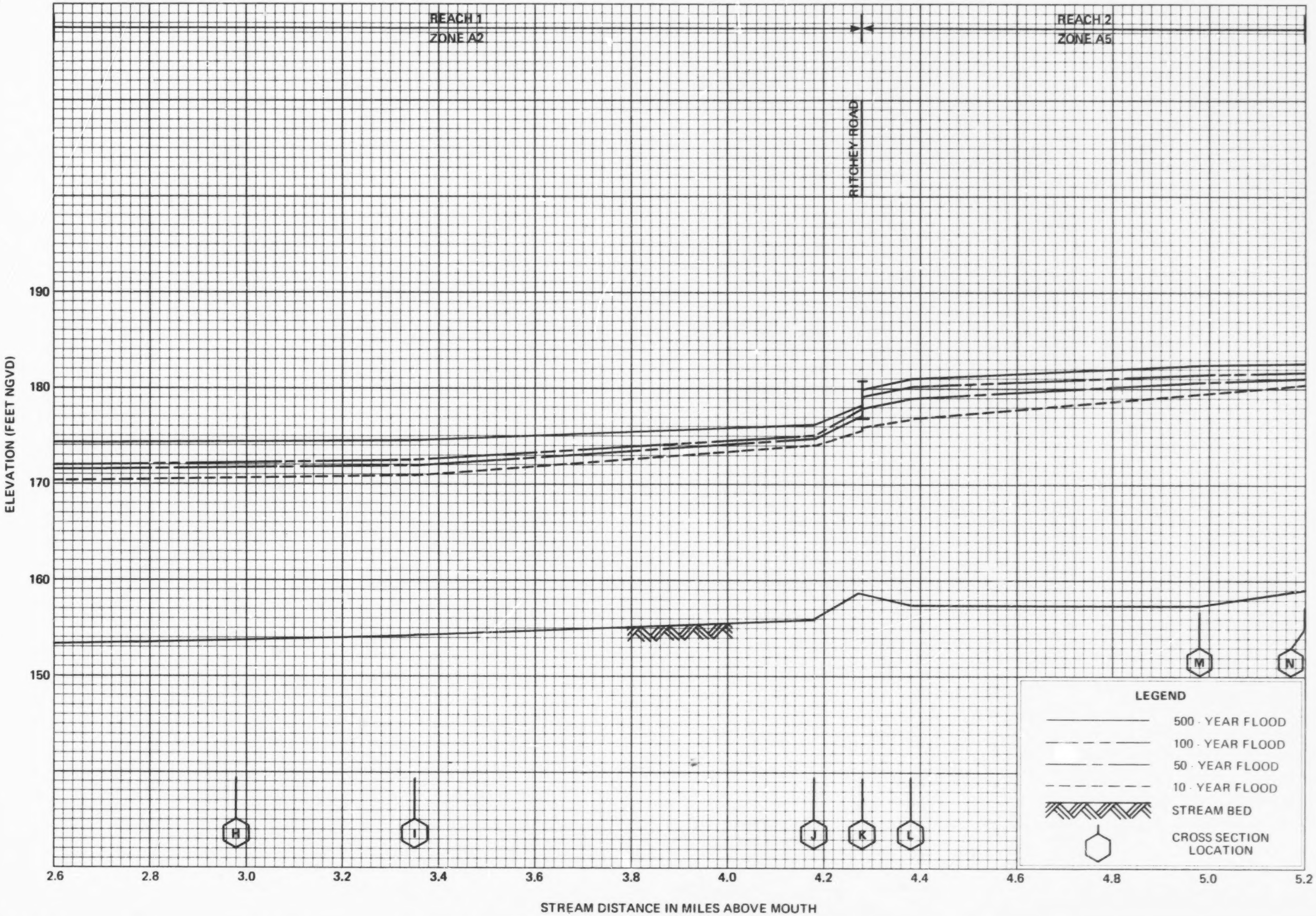
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

63P

BEST DOCUMENT AVAILABLE

117



FLOOD PROFILES

GALES CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

64P

118

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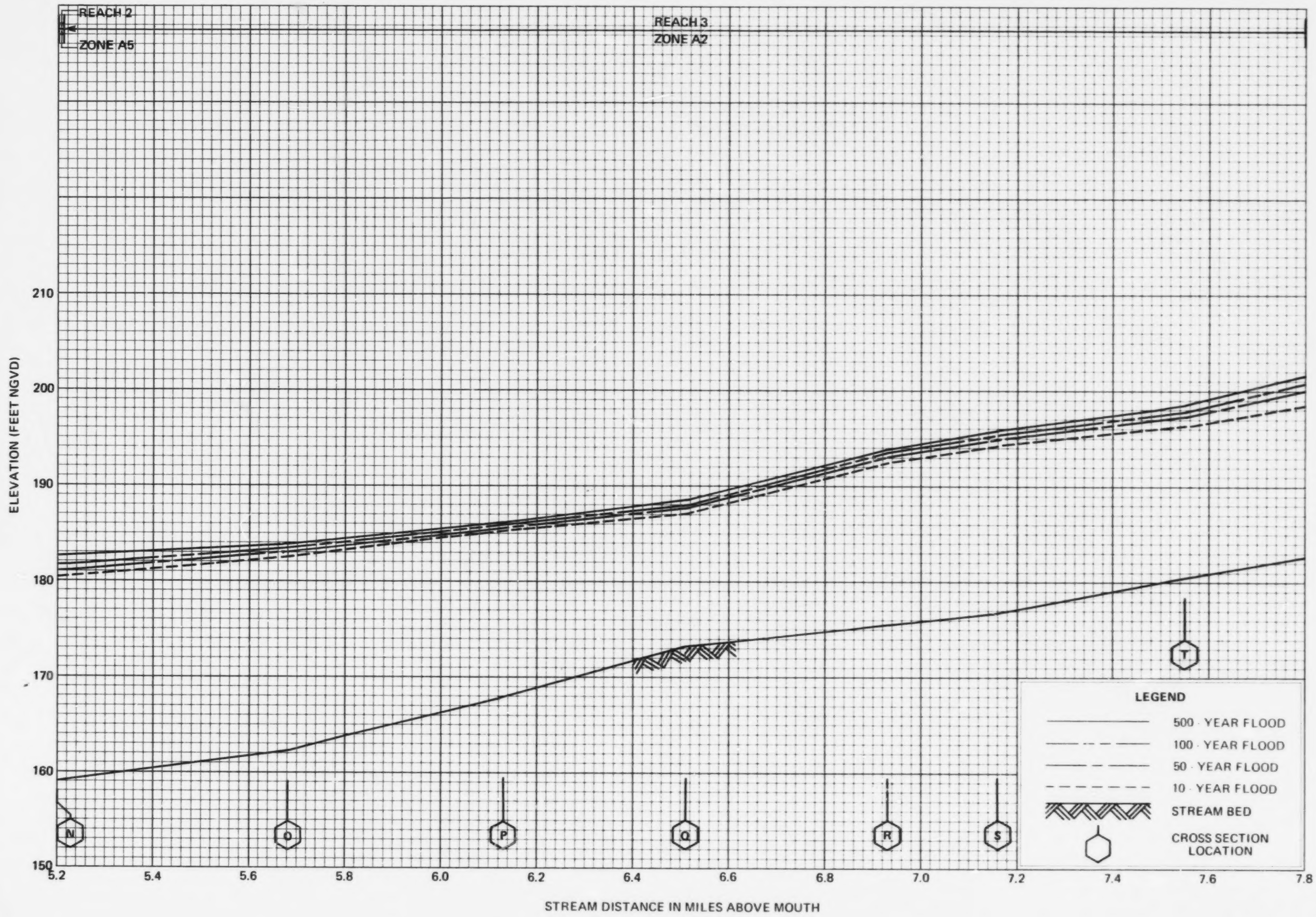

FLOOD PROFILES

GALES CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

65P

119

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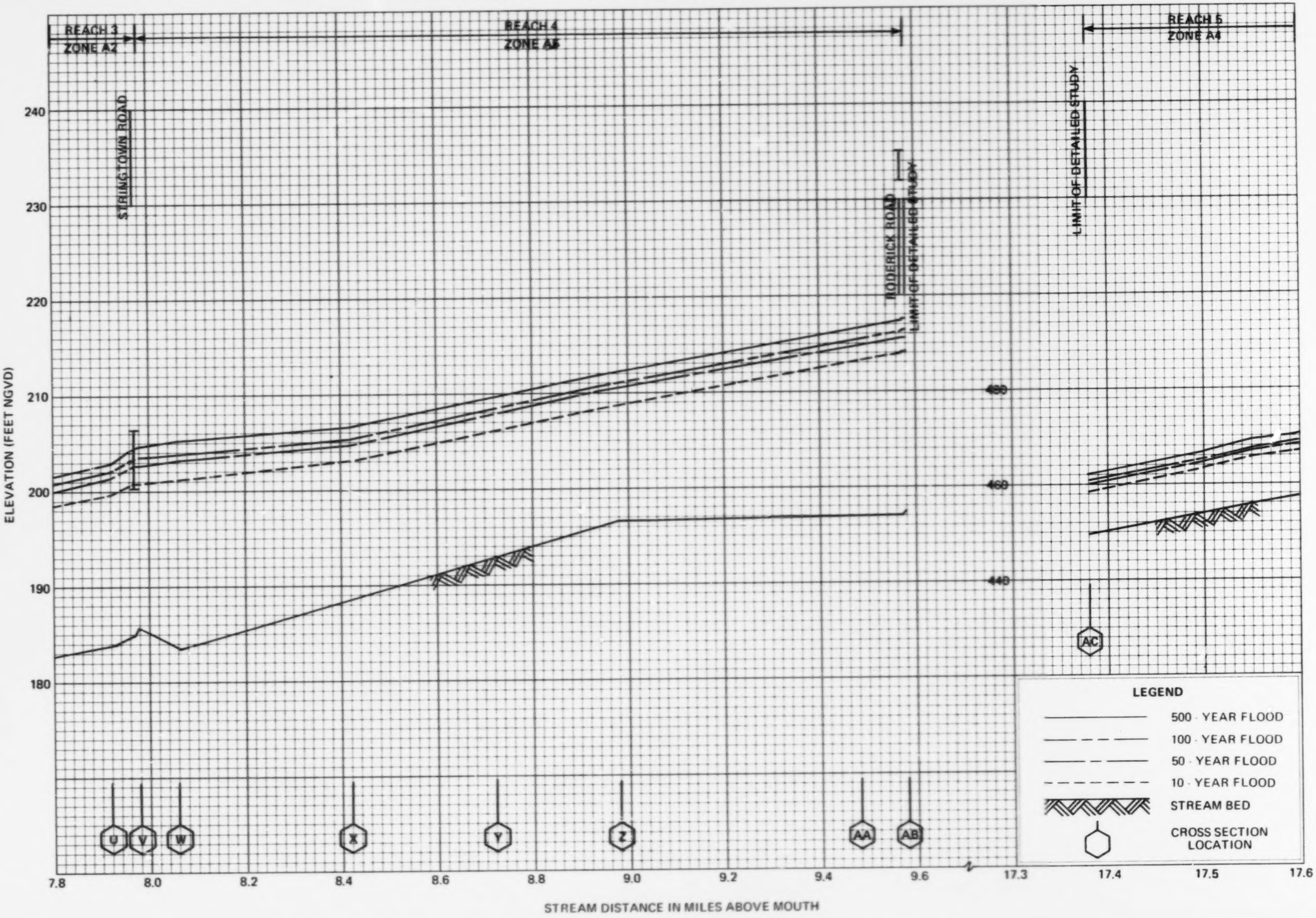

FLOOD PROFILES

GALES CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

66P

120

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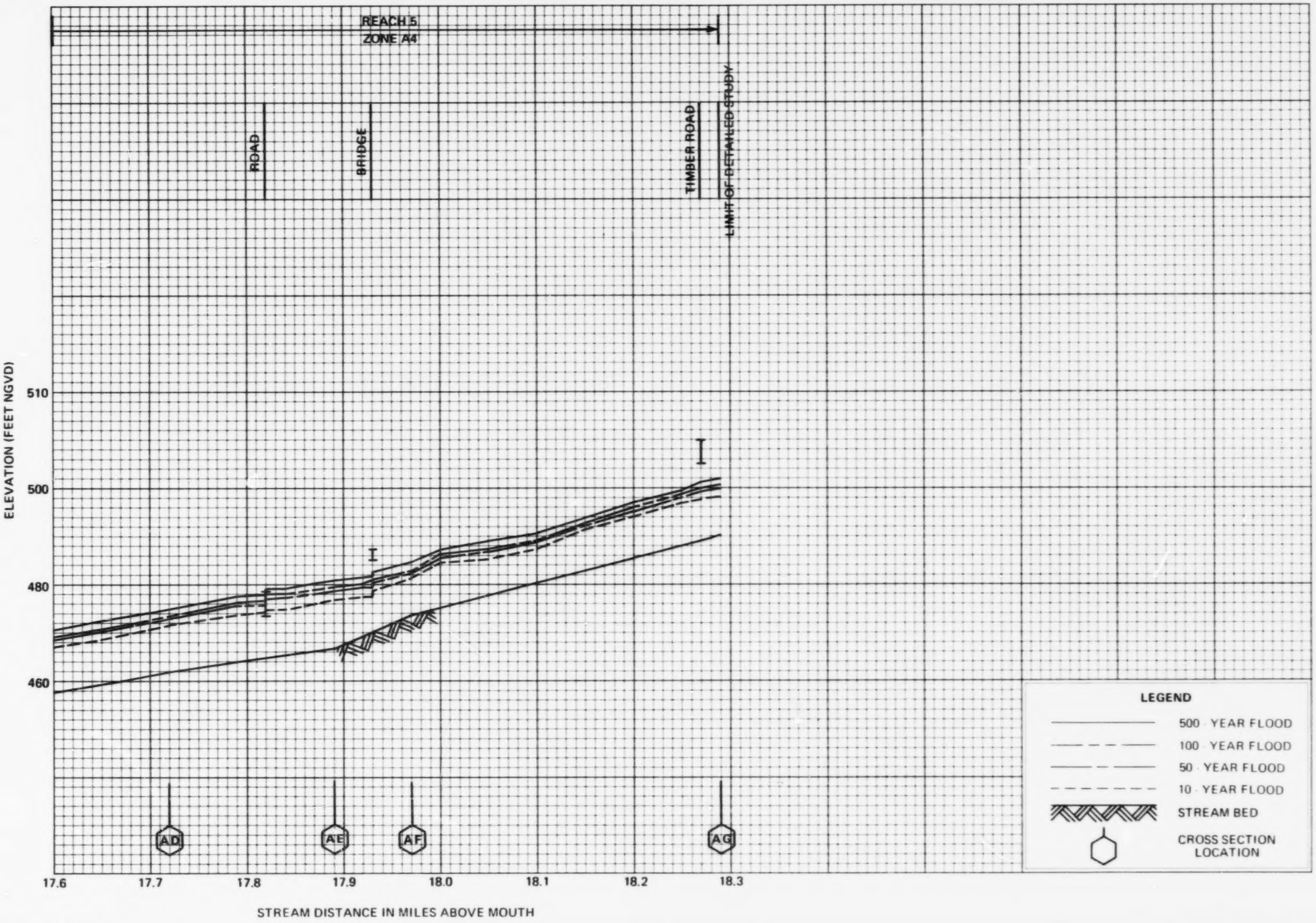
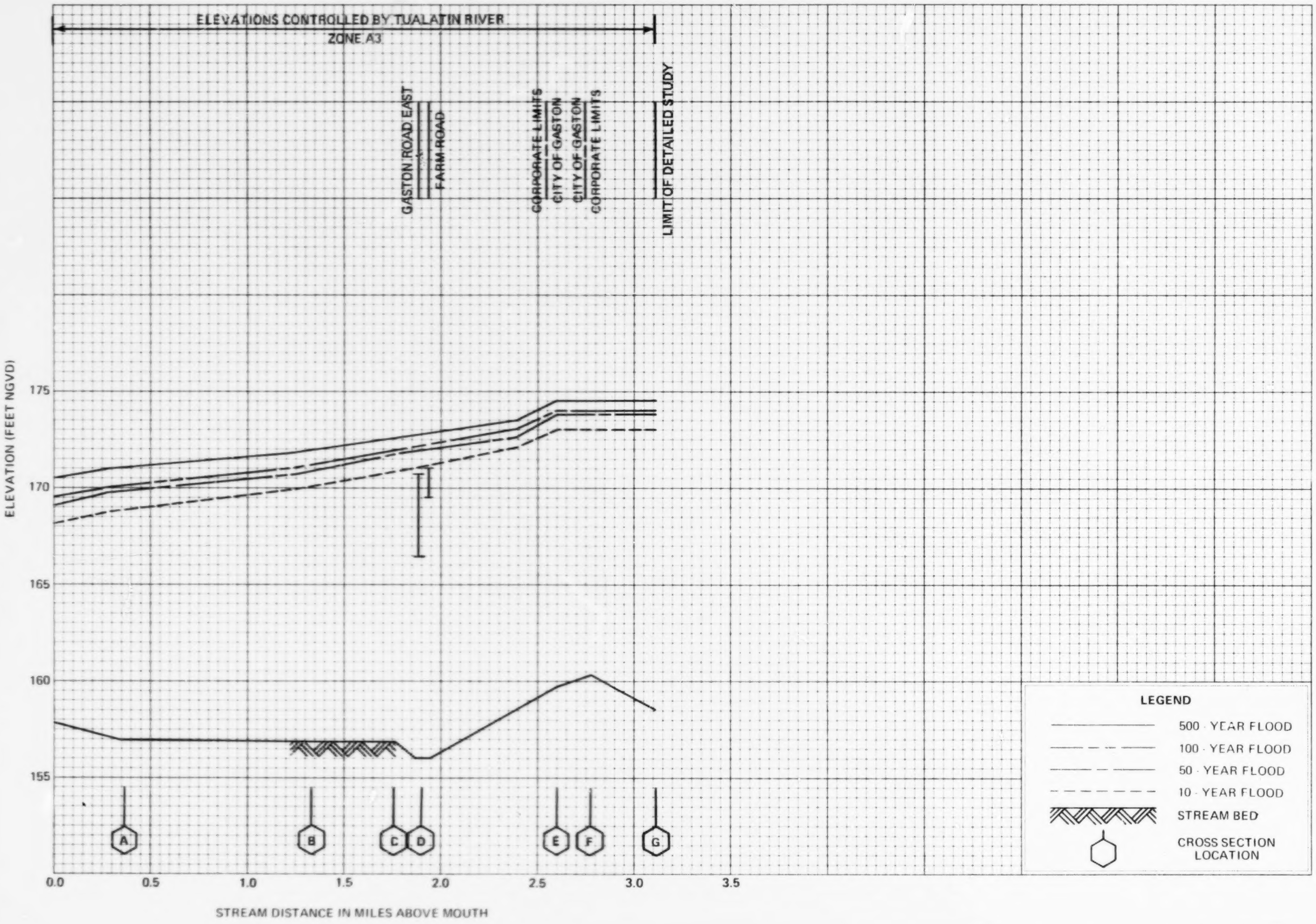


FLOOD PROFILES

GALES CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)



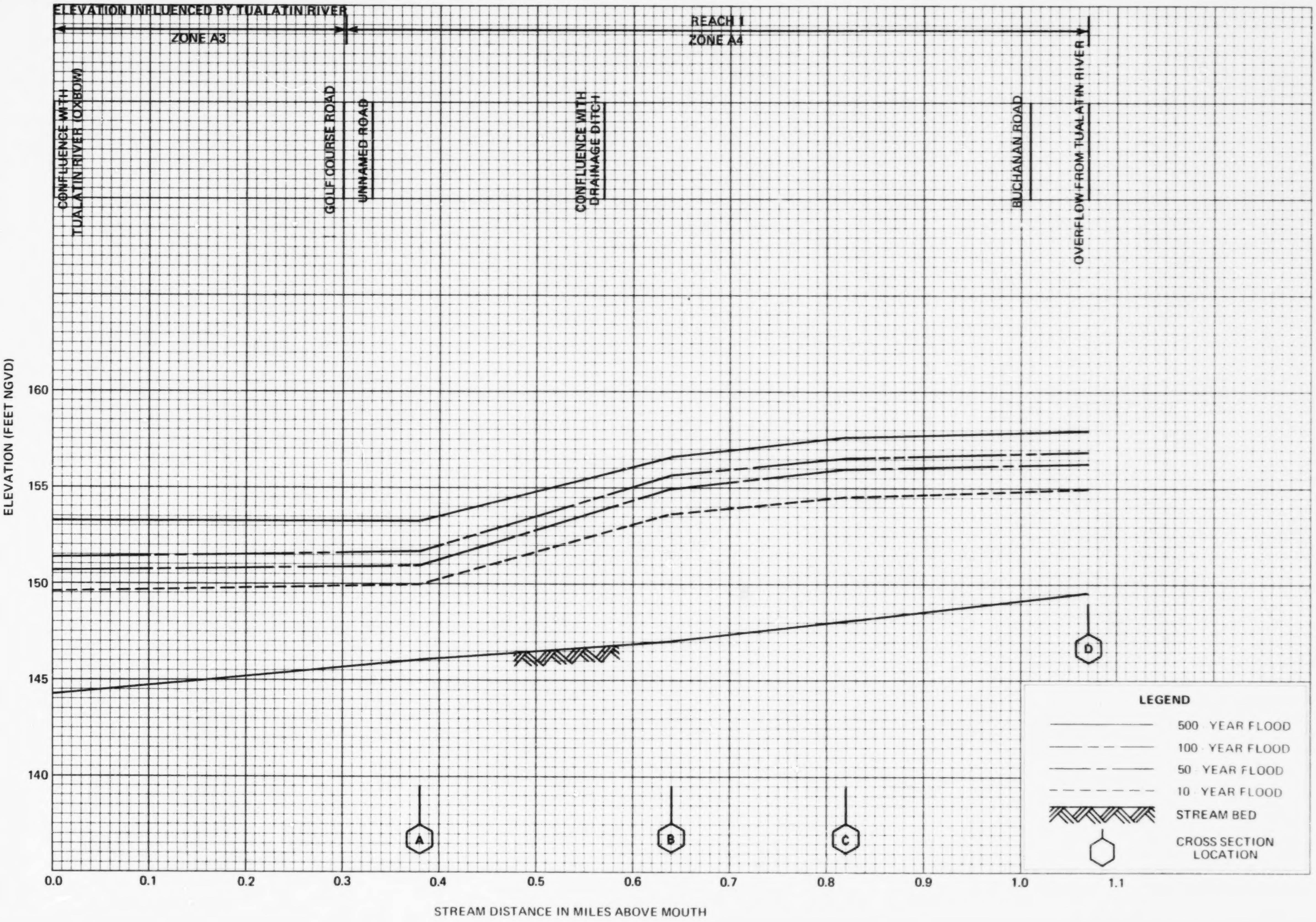
FLOOD PROFILES

WAPATO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

122



FLOOD PROFILES

TUALATIN RIVER SIDE CHANNEL

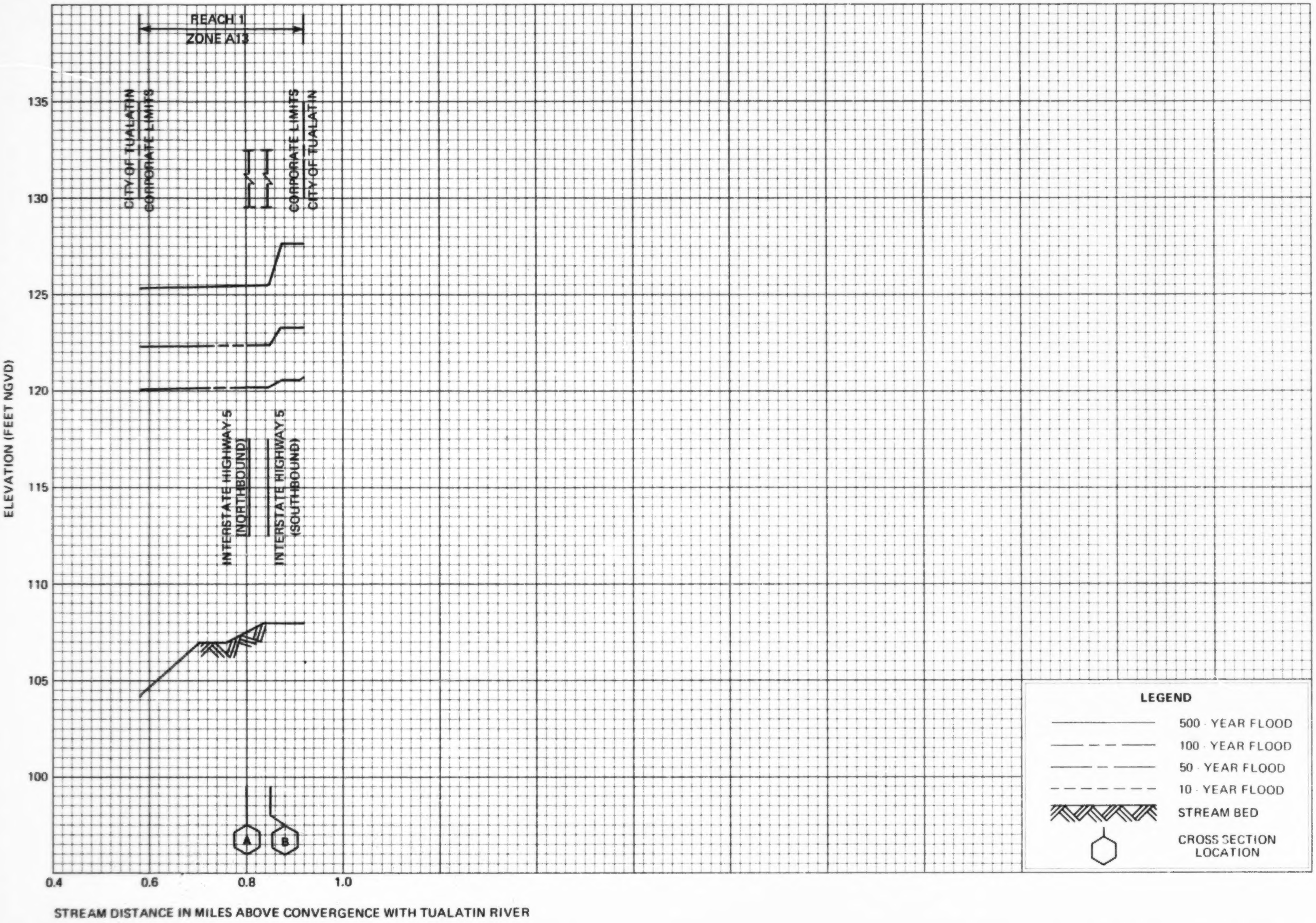
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

69P

123

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

NYBERG SLOUGH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(UNINCORPORATED AREAS)

70P

124

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